

May 1980

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Time Conversion • Imagination Machine • Dealing Bridge Hands

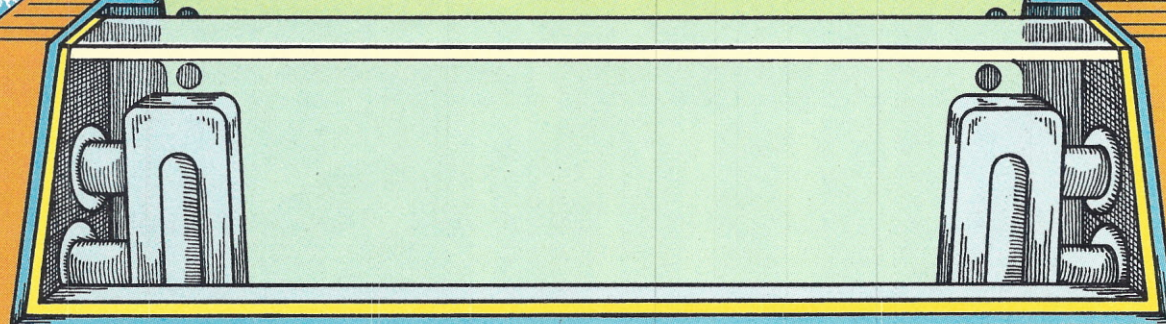
# Personal Computing

For Your Home and Business

How to Buy A Printer  
including Buyer's Guide

Basic Word Processing

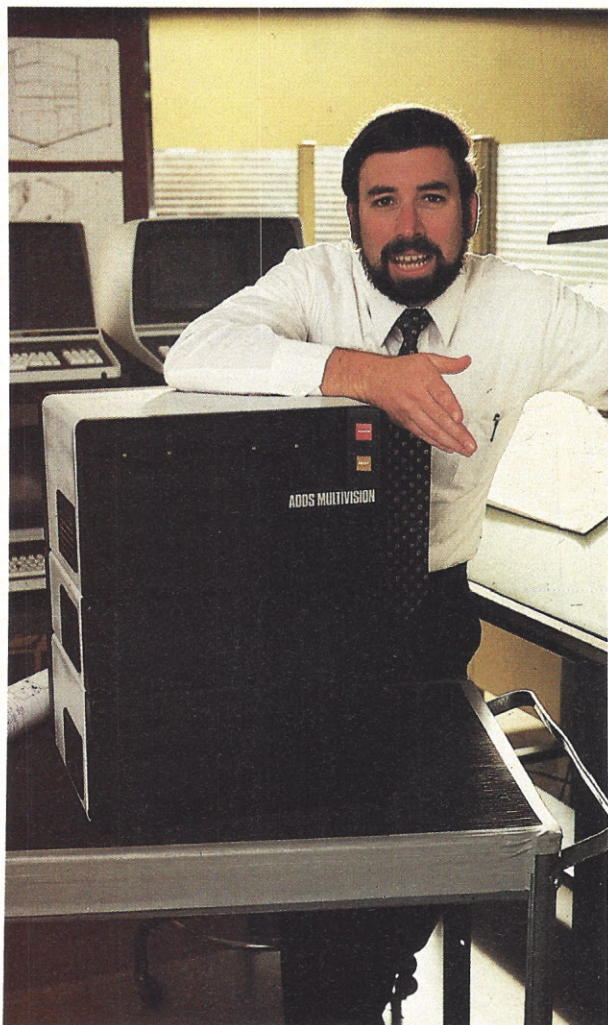
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Effectiveness





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Geof Karlin  
Director of Systems Development



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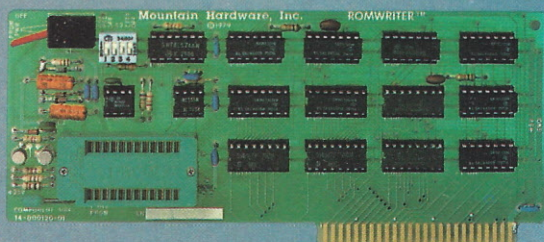
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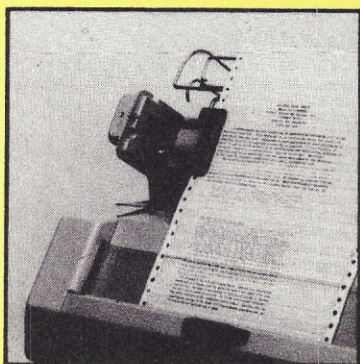
CIRCLE 2

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# Personal Computing

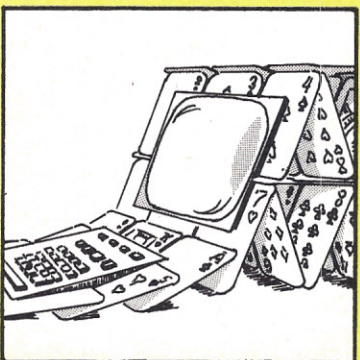
For Your Home and Business



Page 51



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Page 36

## LAUNCHING PAD

### Basic Typesetter .....24

April PC offered Basic Typist, an electronic typewriter and text editing program. This follow-up article extends Typist's capabilities and provides you with a word-processing system. *by Richard R. Galbraith*

### APF's Imagination Machine .....32

Here's a review of APF's Imagination Machine, a computer for home use. Included are descriptions of games and other software offered for the machine. *by David B. Powell*

### Improve Your Programming Effectiveness .....40

Good documentation is essential for successful programming. The author gives useful forms and valuable tips to enhance your programming skills. *by Charles D. Sternberg*

### Real-Time Time Conversions .....47

Instead of wondering what time it is for your friends or business contacts in foreign cities, use this handy program to quickly calculate the hour. *by James H. Nestor*

## DIGGING IN

### How to Buy A Printer .....51

Here's a step-by-step approach to finding the printer best suited for your application. *by Ken Mazur*

### Printer Buyer's Guide .....58

This chart and guide to companies and their printers will help make your selection easier and quicker. Also included is an alphabetical listing of companies and their addresses. *by Ken Mazur*

### Simulating Special Function Keys .....73

You can easily interact with your program with this simple routine which extends your TRS-80's capabilities. *by William Klungle*

## ON THE LIGHTER SIDE

### Anyone for Bridge? .....36

You can duplicate tournament conditions using this program to deal out bridge hands. The program shuffles the deck and deals four hands, simulating actual table conditions, then sorts each hand into suits and prints out the result. As an added bonus, you get a matrix showing the distributions of the four hands and the four suits. *by Peter Jonas*

## DEPARTMENTS

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Cover Illustration by Josh Randall

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# TBS-80 DATA PROCESSING SYSTEMS. ONE STEP BEYOND.

If you thought the TRS-80™ microcomputer was just a toy, think again. These **TBS-80** software systems will turn that computer into a **powerful data processor**.

**INFORMATION SYSTEM** by Dale Kubler is simply the best in-memory, data base manager on the market. It allows you to create files with up to ten fields per record, up to 40 characters per field and 200 characters total per record. Data from the keyboard is entered directly onto a screen display of one entire file.

Once entered, you can sort or search your entire data base by any category and have the information desired displayed on the screen. **INFORMATION SYSTEM** provides a thorough editing mode allowing changes by line without rewriting an entire file.

This program allows you to program your own printouts to almost any form you desire for line or serial printers. Screen prints from anywhere in the program are also available **INFORMATION**

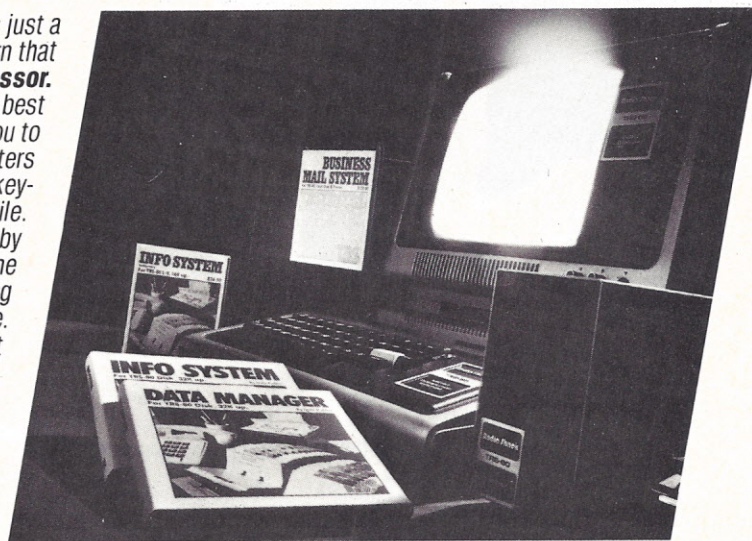
**SYSTEM** creates either disk or cassette files depending upon the version you use. From mail lists to recipes, this program is the ideal small system information manager. The price for this program, 32K up disk is \$34.50. For systems 16K up tape it's \$24.50.

**DATA MANAGER** by Dale Kubler starts out where **INFORMATION SYSTEM** leaves off. Requiring 32K and one disk, it accepts up to ten user-defined fields with up to forty characters per field and 255 characters per record. As with all TBS software, data entry and editing is professional and simple to use. What makes this program stand apart from "in-mem" data managers is that it uses up to four disks on line as memory, or as much as 320K of memory storage. Because disk sorts take more time than in-mem sorts, **DATA MANAGER** enables the user to create and maintain up to 5 "key" sort files for quick access of data. A utility program is provided to calculate the number of records possible since the amount of records you can maintain is dependent on a number of variables. This program also supports the upper/lower case modification, and printouts can be programmed to almost any format and sent to line or serial printer.

Background printing is provided enabling the computer to search and print at the same time. If you already have **INFORMATION SYSTEM**, **DATA MANAGER** will accept those files. A necessity for organized people, this program sells for \$49.50.

**BUSINESS MAIL SYSTEM** by Dale Kubler is designed for large-scale business users. Requiring 32K, two disks and printer, this program will store up to 150,000 names in a single file spread out over multiple disks. Each data disk holds 500 names.

After data entry, BMS automatically sorts the data by zip code and alphabetical order within the zip code. The program tells you when and which data disk to insert, expanding your files automatically until you've reached 300 disks. Data is input directly onto formatted screen display with the option to use Company Name/Attention instead of Last Name/First Name. Three numeric and one alpha code fields are provided to help you use the search and printout mode. **BUSINESS MAIL SYSTEM** allows you to



program the number and spacing of your labels.

With more features than can be described here, this high-powered program sells for \$125.00.

**TEXT MERGE** is the program that puts it all together. If you have the **ELECTRIC PENCIL** from Michael Shroyer, 32K and one disk drive, then this program is a must. It will merge your data base from any of the above programs with an Electric Pencil file. For example, when you write a letter that is going to several hundred people, you can "code" it by entering a field name from the above programs in place of the actual information. Then, when **TEXT MERGE** is run, it will print out your Pencil file and substitute the "code" with the actual data. In other words, you can print out 1,000 personalized letters without stopping the computer. This program will also enable you to selectively search out only the records from your data base that you wish to use. Also included is the ability to set left, right, top and bottom margins, set page numbers anywhere on the page, and print out right justified if you so choose. **TEXT MERGE** will turn your computer into a powerful data processor and it sells on disk for \$49.50.

**TBS** has other incredible software for Tandy's microcomputer. Intent on making it a powerful tool, we have **large scale business accounting systems, general accounting systems, system utilities** and the **Library 100**. We have the only **DISK HEAD CLEANER** (for APPLE too!) and **GRAN MASTER DISKETTES**, the best on the market.

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CIRCLE 4



**"It is a great thing to start life with a small number of really good books which are your very own."— Sherlock Holmes**



**New! DR. DOBB'S JOURNAL OF COMPUTER CALISTHENICS & ORTHODONTIA Vols. 1, 2, & 3** (The People's Computer Company Series) Vol. 1 reflects the changes that took place in personal computing in 1976. Vol. 2 chronicles the emergence of the small computer as a useful tool. Vol. 3 looks at the growing interest in programming languages. **Vol. 1, #5475-0; Vol. 2, #5484-X; Vol. 3, #5490-4; each \$18.95**

**New! S-100 BUS HANDBOOK** (Bursky) Discusses the S-100 bus computer systems and how they are organized. Covers computer fundamentals, basic electronics, and the parts of the computer. Schematic drawings and illustrations are included. **#0897-X, \$7.95**

**New! INTRODUCTION TO TI BASIC** (Inman, Zamora, Albrecht) Covers essential programming statements and machine features of the Texas Instruments' Micro-computer. Discusses animation on the screen, color graphics, sound, music, screen editing, and much more. Each chapter concludes with review questions. **#5185-9, \$9.95**

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## Personal Computing

MAY 1980

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### UPPER/LOWER CASE CONVERSION \$20.00

Reprint of KILOBASIC article explaining how to modify the TRS-80 to display both upper and lower case characters. Kit contains step-by-step instructions, parts, and necessary software on cassette for case reversal, echo, and automatic line feed routines.

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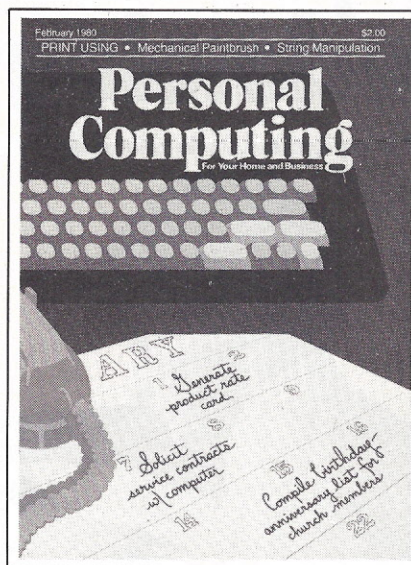
# FEEDBACK

## Mechanical Paintbrush Extras

Dear Editors:

Here are additions to "Mechanical Paintbrush" by Dwight Wheeler in the February 1980 issue (see Figure 1). The additions allow you to save and recall pictures from data files. A clear-the-screen function was also added; use shift (clr). To save a picture, press the shift key and the space key at the same time. Since the shift space key is a unique character (CHR\$(160)), you'll avoid using a character you might want to draw with.

Some of the possible problems in writing a data file program would be the cassette timing problem on the original Pet. Lines 3000, 3040, 3140, 3240 and 3340 solve this problem and are contained in the full *Pet User Manual*. These lines are self correcting; they will only execute if they are needed for old Pets and won't be executed on the new



Pets. Another problem might be an attempt to use an array larger than 255. If you used DIM A%(1000) or DIM A%(4,250) you will not get an error message. This is a bug in the original Pet and has been corrected on new Pets.

There is always room for improvement in a program, as Mr. Wheeler suggests. There is a very good commercially available program called

"Draw" for old Pets. It's available from Peninsula Computer Project, Peninsula Way, Menlo Park, CA 94025 for \$9.95 (plus 6% tax for Californians). "Draw" also comes with a Wumpus-type game called "Quest". Well documented listings are provided.

"Draw" uses the numeric key pad for directions, has a repeat function, uses the graphic characters and has a high resolution mode. You can move over portions already drawn without erasing. "Draw" converts smaller pictures into Basic statements, saves pictures on tape and recalls them. I've used this program for more than a year and a half and have been very satisfied with it.

You can eliminate the erasing portion of Mr. Wheeler's program because you use the space character to erase. If a programmer wants to add diagonals I suggest using the numeric key pads as directions.

Michael D. Gillie  
Lathrup Village, MI

Figure 1

```

7 S$=CHR$(160):REM SHIFTED SPACE KEY
8 C$=CHR$(147):REM (CLR) KEY
9 DIMA%(250),B%(250),C%(250),D%(250)
15 INPUT"YOU WANT A PREVIOUSLY MADE PICTURE";Q$
17 IFLEFT$(Q$,1)="Y"THEN4000
19 PRINT:PRINT"TO SAVE A PICTURE PRESS
  SHIFT & SPACE":PRINT
105 IFA$=S$THEN2300
107 IFA$=C$THEN90
265 IFE$=S$THEN2300
267 IFE$=C$THEN90
2300 X=32767:REM MEM. LOC. OF VIDEO -1
2400 FORI=1TO250:A%(I)=PEEK(I+X):NEXTI
2500 FORI=1TO250:B%(I)=PEEK(I+X+250):NEXTI
2600 FORI=1TO250:C%(I)=PEEK(I+X+500):NEXTI
2700 FORI=1TO250:D%(I)=PEEK(I+X+750):NEXTI
2800 PRINT"(CLR)":REM CLEAR SCREEN KEY
3000 IFPEEK(12*4096)=OTHERPOKE243,122:POKE244,2
3001 REM THE ABOVE LINE IS NECESSARY
3002 REM FOR THE ORIGINAL 8K PETS
3003 REM COMMODORE BASIC VERSION 2
3010 OPEN1,1,1,"BRUSH DATA-FILE"
3020 FORI=1TO250
3030 PRINT#1,A%(I)
3040 IFPEEK(12*4096)=OTHERPOKE59411,53
3041 REM *** VERSION 2 BASIC FIX ***
3050 NEXTI
3120 FORI=1TO250
3130 PRINT#1,B%(I)
3140 IFPEEK(12*4096)=OTHERPOKE59411,53
3141 REM *** VERSION 2 BASIC FIX ***
3150 NEXTI
3220 FORI=1TO250
3230 PRINT#1,C%(I)
3240 IFPEEK(12*4096)=OTHERPOKE59411,53
3241 REM *** VERSION 2 BASIC FIX ***
3250 NEXTI
3320 FORI=1TO250
3330 PRINT#1,D%(I)
3340 IFPEEK(12*4096)=OTHERPOKE59411,53
3341 REM *** VERSION 2 BASIC FIX ***
3350 NEXTI
3960 CLOSE1
3970 GOTO10
4000 PRINT:PRINT"REWIND THE DATA TAPE IF NECESSARY"
4010 PRINT:PRINT"PRESS ANY KEY WHEN YOU'RE READY"
4020 GETQ$:IFQ$=""THEN4020
4100 OPEN1,1,0,"BRUSH DATA-FILE"
4110 PRINT"(CLR)":REM CLEAR SCREEN KEY
4120 FORI=32768TO33767
4130 INPUT#1,X
4140 POKEI,X
4150 NEXTI
4160 CLOSE1
4170 GOTO100

```



## Notation Notes

Dear Sirs:

While I read and enjoy your computer chess articles, I am, as perhaps many others are, somewhat puzzled by the lack of standardization in the chess notation you use. It is difficult to mentally "change gears" and translate between the different notational systems your authors use in a single issue for someone who is not familiar with all the systems.

Would it be possible to require that a reasonably simple notational form be required of authors, preferably either the old-fashioned "P-Q4" style or the algebraic style used by many programs: "D2-D4", or even that position or game notations be done in at least two systems?

Stanley Planton  
Chillicothe, OH

*Editor's note:* We would like to see all chess games submitted to us in algebraic style rather than English (or Russian or German, etc.). So would *Chess Life and Review*, most chess magazines and most chess columnists in this country. Algebraic has already been accepted as the *official* notation. However, anyone that has been swimming in English notation all his life cannot easily get used to the new water. It is like asking a Frenchman to start thinking in German. And to transpose English notation into algebraic for the sake of uniformity is a time-consuming effort that often leads to errors. So we, like many others, try to leave submitted documentation in the "original language." Hopefully, algebraic will someday be the *international* language in chess. —HS

## Where Credit Is Due

Dear Friends:

Your January issue mentions a figure,  $10^{120}$ , as the number of all possible moves on a chess board. This number was first calculated by Claude E. Shannon, the pioneer in information theory, and he published it in 1950 ("Programming a Computer For Playing Chess," *The Philosophical Maga-*

*zine*, 41, 256-275). I did not see the September 1979 issue of *PC*, where this number was first mentioned, and it may well be that "the Russian writer" gives Shannon proper credit. If he didn't, I wish to.

Shannon was also one of the first scientists to recognize the potential for computer intelligence — a story I cover at length in my new book, *Machines Who Think*, W.H. Freeman, 1979.

Pamela McCorduck  
New York, NY

## Sol Word Processing

Dear Editors,

I'm running a SOL 20 with Micropolis Mod II disk drives and I'm wondering if there is a word processor available that will run on such a configuration without CP/M? Any help your readers could provide would be appreciated.

Cavan Kelly  
116 Phillip Ave.  
Scarborough, Ontario  
Canada  
M1N 3R4

## Satisfaction

Sir:

Having experienced a minor problem with a product of a large corporation, I felt that asking for assistance and resolutions would be a waste of time and postage . . . please let me set the record straight! Not only did Verbatim Corporation completely resolve my problem, but I have never encountered such courteous, prompt and conscientious assistance as I received from Mr. John Peters of Verbatim.

It's a refreshing change, in these times of dog-eat-dog microcomputer-oriented vendors, to find out that there are still some companies around that sincerely believe in customer satisfaction, even on an individual level.

William M. Kline, Jr.  
Miami, FL

## The Issue of Intelligence

Gentlemen:

I find your publication very interesting and informative, but articles such as "Pi in the Computer Age" are misleading to the general public.

Computers are only good for two main uses: 1) redundant tasks, and 2) complex computations. All present computer uses can be accounted for in the above two classifications.

Computers are no more "intelligent" than their programmers. And it seems to me that programming is quite misunderstood by the general public. Programming is simply the application of logic to arrive at a viable solution to a problem, and having the program fit within the memory requirements of the given system.

This probably simplifies things too much, but a computer with 32,000 characters of memory cannot operate a program requiring 48,000 characters of memory for program execution. Virtual systems operate differently than fixed memory computer systems, but the programmer still has the same objective on any problem, a solution. When the payroll checks don't come out right, or when the mailing list isn't printed right, it is the programmer who botched the job.

Since the application of logic requires time, the "better" computer programs and computer systems cost money, sometimes tens of thousands of dollars. But you get what you pay for. The low cost of most microcomputer programming has probably hurt the microcomputer entrance into real-world data processing.

So I just would like to remind everyone that when a computer plays a good game of chess, or the payroll checks are correct to the penny, or when a student learns from a computer-assisted program, all these things are owing to the applications programmers. The "computer" hardware simply is the medium through which the programmer communicates with the ultimate user of the system.

Ronald C. Wagener  
Virginia Beach, VA



## 2000 a Leap Year?

Dear Editor:

I believe an error was made in the Beards' article "Stonehenge" (January). In the Program Notes, they state that "lines 610, 620 correct for the year 2000 (not a leap year)." The *Good Housekeeping's Guide to Successful Homemaking* (Revised Edition, 1961) states (under "Calendar Facts"): "Leap years are those whose date numbers are exactly divisible by four, except when they are also exactly divisible by 100. But the years that begin a century can be leap years when they are exactly divisible by 400. Thus 1900 was not a leap year, but the year 2000 will be."

David Beroff  
Bridgewater, NJ

*Editor's Note:* Mr. Beroff is quite correct. Author David Beard notes that the program can be corrected by simply deleting the lines that refer to the year 2000. That is, delete lines 610, 620, 690, 1060, 1170, and 1500. Beard also points out that this error does not seriously affect the running of the program, since the one day error falls with-

in the program's inherent error, anyway. For another solution to the problem, see the following letter by Mr. Kluepfel. — D.W.

To the Editor:

The "Stonehenge" write-up and program by Bonnie J. and David J. Beard err in stating that the year 2000 will be a leap year.

The Gregorian Calendar rule is that years ending in "00" are not leap years unless divisible by 400. The year 2000 is divisible by 400, and is thus a leap year. It is by this method of dropping 3 leap years every 400 years that the Gregorian Calendar year has an average length of 365.2425 days — a good approximation to the true tropical year of 365.2422 days, and an improvement over the old Julian Calendar, in which the average year was 365.25 days, having a leap year every 4 years. If the Gregorian Calendar were to make every century year ordinary, the average year length would be 365.24 days — not as good an approximation to 365.2422 as is the actual 365.2425 of the Gregorian Calendar.

The program can be corrected in one of two ways: either eliminate all the

corrections for 2000 or change the references to the year 2100. The former course would provide the authors' original intention of making the program work until 2099; the latter course would make it work through 2199, which might as well be done, as the coding is already there with only minor modification needed.

Change:

```
330 IF Y<2200 GOTO 370
350 PRINT "(1950 TO 2199
      ONLY)"
610 IF Y<=2100 GOTO 630
690 IF Y=2100 GOTO 710
1060 IF Y=2100 GOTO 1080
1170 IF Y=2100 GOTO 1190
1500 IF Y=2100 GOTO 1520
```

Charles Kluepfel  
New York, NY

## Address Update

*Editor's note:* The address for Michael Shrayor Software, Inc., which was listed in last month's word processing Vendor Guide is out of date. The firm's current address is 1198 Los Robles Drive, Palm Springs, CA 92262; (714) 323-1400. — D.W.

## Line Renumbering

Dear Editors:

The "TRS-80 Line Renumbering" program listing by Blake Ward (*Personal Computing*, January 1980) has proven to be quite useful, but only after I spent much time puzzling over why the program was not fully renumbering all the GOTOs, GOSUBs, etc. Then I discovered a bug in the program which I would like to pass along to your

readers as well as my simple correction.

The original program looks for all the branching words (GOTO, GOSUB, THEN, etc.) in line 60080. If such a keyword is found the program then "looks" at the next byte to see if a line number follows the branching word (Program Lines 60090 to 60110). If a line number is found then it is renumbered, but if a line number does not follow THEN or ELSE, the program simply skips four bytes and looks for

another keyword. The error occurs here because THEN or ELSE may be followed by a second keyword (as in "IF X = 1 THEN GOSUB 100"). This is especially true when THEN is a necessary word for IF...THEN...ELSE statements.

To correct the error I simply added one additional program line (Line 60115) which catches those circumstances where two branching keywords occur together. In such cases the revised program causes execution to return to Line 60090 where the line number following the second branching word will be caught.

The portion of Ward's program to which I have referred along with my correction are printed in Figure 2.

Paul L. Marentette  
New York, NY

Figure 2

```
60080 AA=AA+1: C=PEEK(AA): IF C=0 THEN 60070 ELSE IF
      C<>141 AND C<>145 AND C<>149 AND C<>159 AND
      C<>202 THEN 60080
60090 AZ=AA
60100 AA=AA+1: C=PEEK(AA): IF C=32 THEN 60100
60110 IF C>47 AND C<58 THEN GOSUB 60140: GOTO 60100
60115 IF LN$=" " AND C=141 OR C=145 OR C=149 OR C=159 OR
      C=202 THEN 60090
60120 IF LN$=" " THEN 60080 ELSE IF C=44 THEN GOSUB 60150:
      GOTO 60090
```

Send your letters to Feedback, *Personal Computing*, 1050 Commonwealth Ave., Boston, MA 02215.



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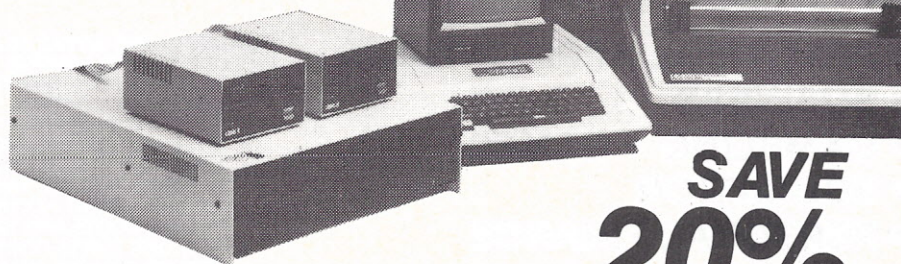
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## WELCOME NCC '80

### NCC '80

More than 45,000 computer professionals are expected to attend this year's National Computer Conference, May 19 to 22 in Anaheim, California.

The show's site, the Anaheim Convention Center, will hold over 1400 exhibit booths in its multi-hall facilities. And, May 20 to 22 at the Disneyland Hotel Convention Center just minutes away, the Personal Computing Festival will take place. This fourth annual "conference within a conference" will feature live demonstrations of small computer equipment and systems and over 150 exhibitor booths.

Both NCC and the Festival will present featured speakers, program sessions and seminars.

The National Computer Conference is sponsored by the American Federation of Information Processing Societies, Inc., (AFIPS) in collaboration with four of its participating member organizations — the Association for Computing Machinery, the Data Processing Management Association, the IEEE Computer Society and the Society for Computer Simulation.

Companies exhibiting at NCC will showcase hundreds of products new and old. Many firms choose not to reveal their new models until NCC itself; for example, last year Radio Shack introduced the TRS-80 Model II, and Apple the Apple II Plus. So you can look forward to some exciting developments from this year's show as well.

Here are a few of the products to look for at NCC.

Okidata will unveil three new matrix printers at NCC. Two are low cost additions to the Microline Series and feature rugged, continuous duty, short line seeking mechanisms. The third is a new Slimline Series graphics unit.



The Slimline SLG provides a choice of two dot densities for alphanumeric printing in addition to its 100 x 100 graphics capability. The unit will print routine reports at 400 lpm with a low density pattern and then switch to a high density pattern to print correspondence at 120 lpm.

The low cost printers, designated Microline II and III, contain two motors and will operate continuously with no duty cycle limitations. The heavy duty units are suited for business as well as hobby use. Their bidirectional, short line seeking mechanisms produce 9 x 7 characters on standard one, two and three part forms.

Microline II, an 80 column unit, operates at 80 cps. One model serves friction, pin and tractor feed forms. The standard platen accommodates friction and pin and optional tractors snap in place for tractor feed. Microline III offers higher speeds on larger forms. It operates at 120 cps and accommodates 132 column, 15" wide forms.

The small Microline II measures 14" wide by 12.2" deep by 4.8" high. Microline III is 4.5" wider.

The Slimline SLG graphics printer operates in both alphanumeric and graphics modes. In graphics mode, it provides a dot density of 100 x 100 dots per inch at a plotting speed of 12 inches

per minute. It will reproduce anything that can be displayed on a CRT screen including areas of solid black. Graphs, maps, bar charts and labels may be printed in addition to foreign language characters including Arabic, Chinese and Farsi.

When used for printing alphanumerics, the Slimline SLG provides a choice of two dot densities. High density characters are formed using 7 x 9 and 7 x 12 matrices and low density characters with 7 x 5 and 7 x 6 matrices.

Okidata will be in booth 2227 at the NCC. The company will also show their CP210 Document/Passbook Printer and 80 megabyte Winchester disk drive.

Okidata Corporation, 111 Gaither Drive, Mount Laurel, NJ 08054; (609) 235-2600.

3M will exhibit their Scotch brand diskettes and cassettes for personal computer users at Booth 3000. Scotch brand 744 Diskettes are certified for dependable performance before leaving the factory. They incorporate these features:

- special formulation of oxides and polymers to withstand temperatures as high as 125 degrees Fahrenheit as well as the wear of diskette usage

- high-temperature-resistant, tough polyvinyl chloride jacket to resist handling damage



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- rayon-blend wiping fabric on both surfaces to protect from dust and other contaminants

- smooth surface for better head-to-disk contact, low abrasivity for longer head life

The new Scotch 830 personal computing cassette is designed for use with microcomputers such as the Apple and the Commodore Pet. Available in both 10-minute and 30-minute lengths, the cassettes are individually packaged in plastic album cases. Suggested price for the 10-minute album is \$2.10; for the 30-minute album, \$2.33.

Cleaning kits for diskette heads, to aid in achieving fewer system interruptions and losses of data, will also be shown by 3M's Data Recording Products Division.

Scotch Head Cleaning Diskettes use a wet-and-dry method by which a cleaning solution is applied to the porous cleaning fabric in the diskette envelope. The cleaning diskette is then run in a normal manner for 30 seconds. Two-sided systems may be cleaned with the same technique.

Each kit includes two diskettes and a bottle of fluid, quantities recommended for a maximum of 30 cleanings (15 per diskette). Suggested list price is \$30. Two cleaning diskette sizes are available; Scotch 7400 kits contain the 8-inch size, and Scotch 7440 kits contain the 5-1/2-inch (mini) size.

3M, Box 33600, St. Paul, MN 55133.

Aspen Ribbons, at Booths 3300 and 3302, will display a variety of new computer products. Their 1980 catalog lists hundreds of items, including printer ribbons, data cassettes and diskettes, files and binders for magnetic media, sheet feeders for various printers, and print wheels, thimbles and Selectric elements.

Aspen Ribbons, 1700 North 55th St., Boulder, CO 80301.

Osborne/McGraw-Hill will feature three new books at NCC. *An Introduction to Microcomputers, Volume 1: Basic Concepts* by Adam Osborne explains the fun-

damental logical framework upon which microcomputer systems are built and used. This second edition updates the 1975 version by covering developments in the field since the earlier book. Price for the 480-page book is \$12.50.

*Z8000 Assembly Language Programming*, also by Adam Osborne, presents fundamental concepts of assembly language programming in general and then covers programming the Z8000. The Z8000 instruction set is described in detail. The book contains programming examples, sample problems, simple programs and troubleshooting hints. Price is \$12.50 for the 500-page book.

*The 8086 Book* by Russell Rector is a reference book for this microprocessor, including programming instructions; 8086 instructions set; 8086 hardware, interfacing techniques and specifications; and applications. The book retails for \$15.

Other Osborne/McGraw-Hill titles include *Pet Personal Computer Guide* by C Donahue and J. Enger (\$15); *Pet and the IEEE 488 Bus* by E. Fisher and C. W. Jensen (\$15); *6502 Assembly Language Programming* by L. Leventhal (\$12.50); and *Some Common Basic Programs* by L. Poole and M. Borchers (\$12.50). Programs from this last book are also available on Pet disk (\$22.50) and Pet cassette (\$15).

Osborne/McGraw-Hill, 630 Bancroft Way, Berkeley, CA 94710; (415) 548-2805.

MicroPro (Booth 16) will demonstrate a file management/versatile S-100 interface/low cost printer combination package designed for use with CP/M and MP/M compatible microcomputer configurations. The package includes MicroPro WordStar word processing software, the recently introduced I/O Master interface board, and the letter quality, 55 cps NEC Spinwriter parallel printer. The total system is offered at a suggested retail price of \$3195.

Features include simultaneous use of high speed line printers (Centronics or Data Products

compatible) and dual synchronous/asynchronous serial ports with FIFO buffering to prevent loss of keystrokes during disk I/O and MP/M task switching.

Allowing flexible use of either lower cost letter-quality printers and/or highspeed line printers within the same microcomputer configuration, the I/O Master S-100 Interface Board from MicroPro will also be shown at NCC.

Interfacing easily with less expensive versions of the NEC, Diablo and Qume letter-quality printers, I/O Master can also be used with highspeed Centronics/Data Products printers for draft and non-letter-quality applications.

Combining four boards in one, I/O Master features two each serial and parallel ports. To insure that keystrokes and data are not lost during disk I/O and MP/M task switching operations, I/O Master's two 8251-based serial ports each have built-in 32-character FIFO buffers. All I/O Master options are DIP switch selectable. The unit costs \$400.

MicroPro's DataStar word processing software is a forms-control oriented, general purpose data entry, retrieval and update system designed for office personnel usage. The keyboard input format was designed for high-volume production by clerk typists. Its displayed menu of operator prompts was designed for easy learning.

Complete control is provided by visual feedback over forms design, individual field length and recording attributes, data entry order, data verify procedure (selective field verify, by field order, by sight, re-type or list match), disk record format as well as arithmetic processing using any combination of field, constant and file-derived numeric data.

Completely CP/M compatible, DataStar operates with any CRT terminal or video board possessing addressable cursor and 32K to 48K RAM. Data files constructed by DataStar are compatible with any CP/M-MP/M supported lan-



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guage including CBasic, Basic, Fortran, Cobol. Price is \$350.

MicroPro International Corporation, 1299 Fourth Street, San Rafael, CA 94901; (415) 457-8990.

Two new disk drives will be features at Pertec Computer

Corp.'s booth (Booth 2335). The iCOM 3712 single density and the 3812 dual density dual flexible disk drive systems consist of a controller, two PCC flexible disk drives, a power supply and a desktop cabinet. The 3712 system has a storage capacity of 0.5

megabytes, while the 3812 provides a full megabyte of data storage. Software available includes iCOM RTOS, CP/M, Microsoft B Basic and Microsoft Fortran-80.

Pertec Computer Corp., 21111 Erwin St., Woodland Hills, CA 91367; (213) 494-2093.

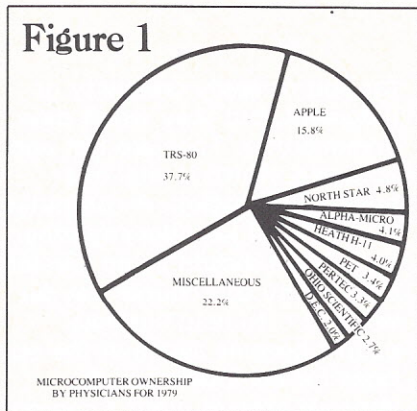
## TRS-80 and Apple Top Survey of Doctors Using Micros

Tandy's strong showing in 1978 among physicians seems to be losing steam, according to a recent survey conducted by the Physicians Microcomputer Report (PMR) and reported in the following excerpt from PMR, Vol. 2, No. 10:

Of five thousand paid subscribers queried by the report, 9.4% returned a comprehensive questionnaire. About 65% of these physicians presently own a microcomputer.

Figure One gives a breakdown of market share held by various manufacturers on a unit volume sales basis for 1979. Tandy's TRS-80 holds a commanding 37.7% share of the market.

**Figure 1**



Apple has nearly 16% of the market. Other companies having a two to five percent market share include North Star, Alpha Micro, Heath, Commodore, Pertec, Ohio Scientific and Digital Equipment.

Other systems having less than a two percent market share include Exidy, Southwest Technical Products, Vector Graphics, Cromemco, IBM 5110, Data General's Micronova, and Heath's H-8. Included in the miscella-

neous category are the now discontinued IMSAI and Processor Technology products which together garnered nearly nine percent of the market in 1979.

A frequency breakdown of products mentioned by doctors considering purchase of a system in 1980 is given in Figure Two. Surprisingly, Apple and the TRS-80 are nearly equal in terms of future purchase plans.

Monitoring of this market shows that Apple has made steady gains in market share at the expense of the TRS-80 and others.

After Tandy's strong showing in 1978, PMR expected them to become the IBM of microcomputers in 1979 with fifty to sixty percent of the market. Other systems mentioned for purchase in 1980 include Ohio Scientific, Texas Instrument's 99 series, Cromemco, Alpha-Micro and Heath's H-11.

PMR's survey shows that nearly 40% of their subscribers operate one man practices. Twenty percent are members of two man practices and over eleven percent are members of three man practices.

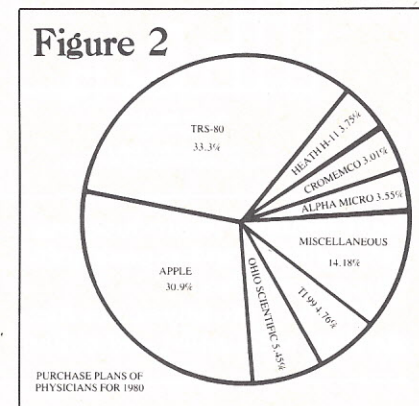
Queries on programming abilities of readers revealed that 53.4% know the rudiments of programming.

The most popular language is Basic, which was mentioned 62.3% of the time. Fortran was the next most popular language mentioned 15.8%. Assembler was mentioned 8.9% of the time, PL1 5.2% of the time and Cobol 4.8% of the time. Pascal and Mumps were mentioned 3.9% and 1.9% of the time respectively.

Nearly sixty percent of the

physicians indicated that they would like to access large medical data bases from their home or office. A comparable percentage plan to use microcomputers for investment analysis.

**Figure 2**



PMR's survey results show that over 50% of the responding physicians expect to pay less than \$10,000 for hardware. Nearly a third of the respondents expect to pay \$5000 to \$10,000 for hardware.

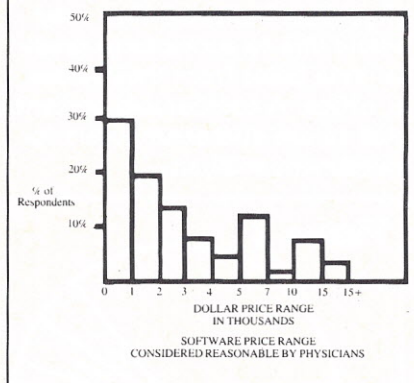
Results of the survey on software price produced some startling results as demonstrated in Figure Three. Nearly thirty percent of the respondents expect to pay less than one thousand dollars for the software they require. Nearly seventy percent expect to pay less than \$5000. This means that custom programming approach of system houses is liable to run into big difficulties with regard to recovering service and software costs. It seems more reasonable that the mass marketing of canned, modular software will meet the price expectations of most physicians. This also suggests that the hardware manufacturers that dominate the market can pick up sub-



# RANDOM ACCESS

stantial revenue by developing the appropriate software. Alternately, an independent software house with sufficient dedication to this particular market and writing for the most widely used systems could be very successful. At this point it appears that most physicians do not recognize the magnitude of the invest-

**Figure 3**



ment required to produce, market, maintain and expand software capabilities.

60.6% of the physicians handle their accounting and billing

functions manually with 17.6% specifically mentioning the peg-board system. A little over 20% of the respondents use computers for billing presently although this is probably not representative of the overall medical community. About 18% of the physicians use a service or book-keeper for handling billing and accounting.

Table one lists the professional applications mentioned by physicians in order of popularity. The diversity of applications is tremendous and varies from one physician to the next. At the present time, there is not a coherent financially backed effort to develop the software necessary for all of these interests.

Many of these areas are being covered in a fragmented way by various commercial and academic organizations using a wide variety of hardware and varied languages and operating systems.

For more information on *The Physicians Microcomputer Report*, contact them at Box 6483, Lawrenceville, NJ 08648.

**TABLE 1**

Professional applications of small computers by physicians in order of popularity.

1. Billing
2. Accounting
3. Medical Records
4. Word Processing
5. Literature File
6. Insurance Billing
7. Computer Assisted Instruction
8. Data Base Applications
9. Research
10. Lab Applications
11. Appointment Scheduling
12. Statistics
13. Computer Aided Diagnosis
14. Patient History
15. Control Systems
16. Medical Testing
17. Inventory
18. Drug Interactions
19. Practice Survey
20. Medical Simulations
21. Intensive Care Monitoring
22. Payroll
23. Epidemiology
24. Emergency Room
25. Health Hazards Appraisal

## Small Business Workshop on Computer Use

- A Madison car rental agency needs to streamline fleet and maintenance control for its 100 cars.

- A realtor has missed several large sales because he is unable to quickly link potential buyers with newly available listings.

- Anticipating a decline in volunteer involvement over the next few years, the Y is looking for an alternative method of handling memberships, a job currently done by volunteers.

- A physician's group wants an efficient means of keeping medical and financial records and cross-referencing lists of incompatible drugs.

- A manufacturing executive needs to understand potential applications of a computerized dispenser his company has just developed.

Each of the listed businesses is considering using a business com-

puter. To explore available options, all participated in a small business workshop on computers sponsored by the University of Wisconsin-Extension Small Business and Outreach.

Jerry Rolefson, instructor for the comprehensive one-day program "Computer Services for the Smaller Firm," commented on the great strides in computer technology since the advent of the minicomputer. He noted that cost and technology have developed to a point where computer use is realistic for business of all sizes.

The course gave an overview of what computers can and cannot do and what to look for when shopping for a system.

"In particular," Rolefson mentioned, "computers are best suited for recordkeeping, process control and scientific programming. They won't make decisions

for you or apply creativity or judgment, but they won't day-dream either. They are fast and accurate, which is vital in a business operation. A computer is a tool and just like any other tool, there should be no mystery. That's why this course was developed — to help business people become aware of the options for computer use, to improve present use if a computer is already in service and to update data processing knowledge."

Dennis Collins, vice-president of Southwestern Realty in Platteville, and his partners attended the workshop. Their company is in a growth period and they'd like to expand without adding more staff.

"We feel that automation is the key to growth and becoming more efficient," Collins said. "The workshop helped us put



# RANDOM ACCESS

computerization into perspective — both money and time-wise. We had anticipated adding a computer some time within the next few months. Now it looks like an in-house computer is a year or so down the road. In the meantime, we'll probably be going to a computer service."

On the other hand, Gary Richard, vice-president and manager of Budget Rent-A-Car of Madison, already had a small personal microcomputer system and was looking for ideas to apply it to business use. Richard has since programmed his computer to close out rental agreements.

"We use it like a fancy cash register," Richard said. "A rate structure for each car size is entered and we can estimate gas charges and maintenance. Contracts are closed faster with

fewer errors that cause ill will. It has saved us money by catching the small charges that slip through." In the future, Richard plans to set up a computerized depreciation schedule for each car.

In anticipation of a decline in volunteers, the Madison YWCA hopes to save time and money by computerizing membership records, a job currently handled by volunteers. According to staff member Virginia Williams, their most difficult task is selling the board of directors on the advisability of converting their records to computer.

Williams added that they would like to be able to cross check contributions against fund raising mail lists. The long-term plan is to computerize residence records and bookkeeping. Computers also tabulate on-

going inventories and cash flow. Another participant, Len Kilby, vice-president of the Berg Company, Madison, said, "We've developed a minicomputer for the bar and restaurant industry which computes the numbers of drinks and cost as they are dispensed, then tabulates cost vs. tips. It's six times more powerful than the less sophisticated mechanical version."

Rolefson noted that while the workshop doesn't attempt to answer all the questions about computers in one day, it does present valuable questions that need to be raised when looking at the possible use of a computer.

The workshop is offered again in Fall 1980. For more information contact Small Business and Outreach, University of Wisconsin-Extension, 1 S. Park St., Madison, WI 53706.

## Space Shuttle Instrumentation Controlled by Micro

When the NASA Space Shuttle makes its initial flight into orbital space some time in mid or late 1980, on board to control instrumentation and experiments will be a versatile microcomputer developed at the San Ramon Operations of EG&G Energy Measurements Group, a major segment of EG&G, Inc.

The light-weight, low-power microcomputer was developed by the EG&G unit's Electronic Systems Department and will support scientific investigators as they perform in-flight research aboard the Space Shuttle craft.

Categorized by NASA as Life Sciences Laboratory Equipment (LSLE), and referred to (at the L.B. Johnson Space Center) simply as the "Micro", this system has a memory capacity of 32,000 12-bit words (in various combinations), weighs under 27 pounds, requires only eight watts (maximum) power, and is capable of executing the entire instruction set of the Digital Equipment Corporation's PDP-8/E 12-bit minicomputer.

EG&G's San Ramon Opera-

tions is furnishing 13 of the microcomputer systems to the Center to support the Space Shuttle's life sciences experimental program.

The Shuttle's LSLE Micro is a single-address, fixed word-length, parallel-transfer machine that uses two's complement arithmetic. The wide range of services it provides to Spacelab experiments while operating in either a host or a satellite configuration includes data acquisition, processing, formatting and transmission capabilities.

Micro also provides non-volatile program and data storage, monitoring and display; has command and control capabilities for experiments and Spacelab subsystems; and provides a full set of caution and warning services.

In addition, the Micro is designed to accommodate both analog and digital input/output operations, with a high degree of flexibility implemented in both.

Any number of these modules up to eight may be incorporated into one system, with the configurations or board type depending



on the end-user's requirements.

The memory modules with EPROM devices store data or programs that must be retained during power-off conditions. The EPROMs are programmed and tested in the systems before Shuttle flight integration.

With the advent of the NASA Space Shuttle flights, the transporting of large payloads of men and equipment to and from earth-orbital space may one day become a routine event.

In addition to reducing the relative cost and complexity of orbital operations, the Shuttle will lessen or eliminate the stress on men and materials previously associated with transportation to and from space — thus giving scientists the opportunity to take part directly in their LSLE experiments, said EG&G.



# RANDOM ACCESS

## ☆☆☆ Announcements ☆☆☆

A TRS-80 Interfacing and Programming for Instrumentation and Control course will be held June 23-27, 1980, at the Virginia Polytechnic Institute and State University in Blacksburg, VA.

Participants in the hands-on workshop will work with and design TRS-80 interfaces. For more information contact Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg, VA 24061; (703) 961-5241.

The Computers and Communications Committee of the Engineering Society of Detroit (ESD) will conduct a one day seminar on June 4 entitled "Small Computers and the Professional". The program is designed to meet the information needs of business professionals who are considering a purchase or expansion of a small computer system. Twelve speakers and 20 exhibitors will be available between 8:30 a.m. and 5:00 p.m. Attendees can customize an agenda to meet individual needs — hardware, software, industry trends, training, applications. ESD is located at 100 Farnsworth at John R (just opposite the DIA), Detroit, MI 48202. The \$75 ticket covers all activities including lunch. For more information call Carol Lynn (313) 832-5400.

The New Jersey Personal Computer Show and Fleamarket will be held September 27-28, 1980, at the Holiday Inn (North) Convention Center at Newark International Airport, NJ. The show, produced by Kengore Corp., will feature a large indoor commercial exhibit and sales area, an outdoor fleamarket with room for 100 sellers and user group forums for hobby computing systems.

Sellers of computer systems, accessories, software, books and parts will appear at the show, which is aimed at hobbyists

and small businessmen.

Show admission is \$5 at the door, \$4 in advance or with \$1 discount coupon. Over 15,000 coupons will be distributed within a 500-mile radius of the show site. For more information contact Kengore Corp., 9 James Ave. Kendall Pk., NJ 08824; (201) 297-6918.

Telecomputing Corp. of America, developers of the information utility called "The Source", is publishing the monthly magazine "Sourceworld". It will reach the national Source subscriber network.

The magazine, designed for users at TCA's home computer information medium, assists in using over 2000 programs and data bases already available on the Source.

The premiere issue has 48 pages and full-color covers in standard 8 1/2 x 11 format. Feature stories develop backgrounds for two of the data bases on the Source (United Press International and the Wine Library, provided by "Les Amis du Vin"). Also presented are technical orientations to special functions and uses of the Source and a dialogue and interview with "Bizwiz", the financial analyst of the Source.

Sourceworld, edited by Noel Jan Tyl, sells for \$2 per issue. For more information contact Telecomputing Corp. of America, 1616 Anderson Rd. McLean, VA 22102; (703) 356-6790.

Frontier Computing Inc. has announced the *SS-50 Newsletter*, which contains hardware and software features, question and answer columns, news releases and other articles of interest to the 6800 and 6809 user. The newsletter is issued six times a year. Subscription price is \$12 per year. A free sample issue is available on request.

Also coming is *The ABBS Newsletter*, a quarterly publication for Apple Bulletin Board System users, and *The Computerized Classroom*, a magazine for educators at the primary and secondary levels.

For more information contact Frontier Computing Inc., 666 N. Main, Logan, UT 84321; (801) 753-6530.

The 4th Annual National Small Computer Show will be held at the New York Coliseum, October 30 to November 1, 1980, announced Ralph Ianuzzi, show manager.

In 1979, the show hosted approximately 10,000 visitors, including dealers, OEMs and end users in business, retailing, accounting, banking, insurance, research, manufacturing and education.

The 1980 show will offer hourly lectures on topics of current interest in data processing and word processing applications for small computers. Computers on display in the show range from \$500 to over \$150,000. A wide variety of software is also presented.

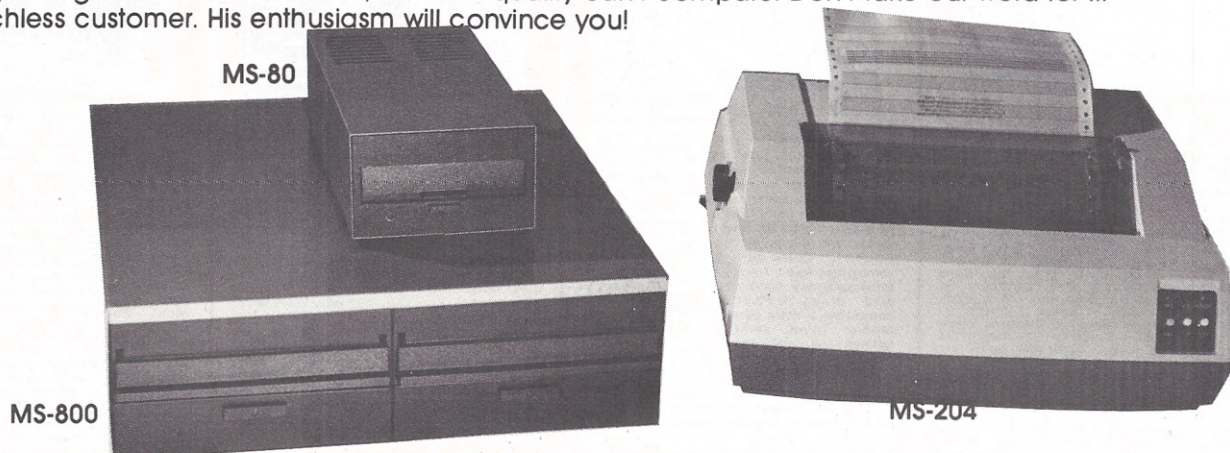
Lectures will include educational software for schools, uses of Pascal in business applications, ways to handle data with file processing, overviews of process control with explanation of D/A and A/D conversions, programming in Basic, introduction to small business systems, the type of hardware being designed now for future use, educational applications in the home, law office systems aspects of word processing, and compilation and retrieval of personal medical data by the doctor with automatic numeric encoding to economize on data filing.

The lecture schedule will consist of thirty 50-minute presentations. For more information contact National Small Computer Show, 110 Charlotte Place, Englewood Cliffs, NJ 07632; (201) 569-8542.



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| TRS-80 I  | \$395                      | \$1695*                 | \$2195*                 | \$795             | \$270                          | \$500                            |
| TRS-80 II | N/A                        | \$1095**                | \$1595**                | \$795             | \$270                          | \$500                            |
| Apple II  | N/A                        | \$1645*                 | \$2145*                 | \$870***          | \$270                          | \$500                            |
| S-100     | \$395                      | \$1095**                | \$1595**                | \$795             | \$270                          | \$500                            |

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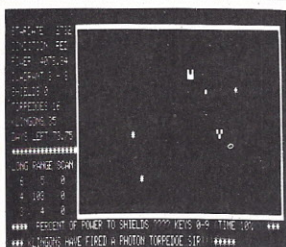
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# SOFTWARE → TRS-80 ← SOFTWARE



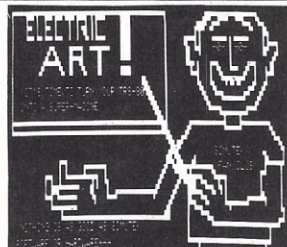
**PACKAGE ONE INCLUDES: GRAPHIC-TREK 2000** — This full graphics, real time game is full of fast, exciting action! Exploding photon torpedoes and phasers fill the screen! You must actually navigate the enterprise to dock with the giant space stations as well as to avoid Klingon torpedoes! Has shields, galactic memory readout, damage reports, long range sensors, etc! Has 3 levels for beginning, average, or expert players! **\* INVASION WORG** — Timer: 3099, Place: Earth's Solar System Mission: As general of Earth's forces, your job is to stop the Worg Invasion and destroy their outposts on Mars, Venus, Saturn, Neptune, etc! Earth's Forces: Androids — Space Fighters — Lazer Cannon — Neutrino Blasters! Worg Forces: Robots — Saucers — Disintegrators — Proton Destroyers! Multi level game lets you advance to a more complicated game as you get better! **\* STAR WARS** — Maneuver your space fighter deep into the nucleus of the Death Star! Drop your bomb, then escape via the only exit. This graphics game is really fun! May the Force be with you! **\* SPACE TARGET** — Shoot at enemy ships with your missiles. If they eject in a parachute, capture them — or if you're cruel, destroy them! Full graphics, real time game! **\* SAUCERS** — This fast action graphics game has a time limit! Can you be the commander to win the distinguished cross! Requires split second timing to win! Watch out!

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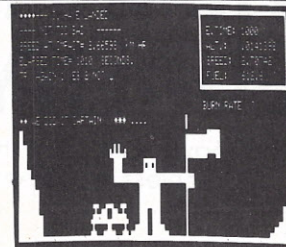
**PACKAGE TWO INCLUDES: CHECKERS 2.1** — Finally! A checkers program that will challenge everyone! Expert as well as amateur! Use 3-ply tree search to find best possible move. Picks randomly between equal moves to assure you of never having identical games. **\* POKER FACE** — The computer uses psychology as well as logic to try and beat you at poker. Cards are displayed using TRS-80's full graphics. Computer raises, calls, and sometimes even folds! Great practice for your Saturday night poker match! (Plays 5 card draw). **\* PSYCHIC** — Tell the computer a little about yourself and he'll predict things about you, you won't believe! A real mind bender! Great amusement for parties. **\* TANGLE MANIA** — Try and force your opponent into an immobile position. But watch out, they're doing the same to you! This graphics game is for 2 people and has been used to end stupid arguments. (And occasionally starts them!) **\* WORD SCRAMBLE** — This game is for two or more people. One person inputs a word to the computer while the others look away. The computer scrambles the word, then keeps track of wrong guesses.

ONLY \$12.95



**PACKAGE THREE INCLUDES: POE-TRY** — This program lets you choose the subject as well as the mood of the poem you want. You give TRS-80 certain nouns or names, then the mood, and it does the rest! It has a 1000-word + vocabulary of nouns, verbs, adjectives and adverbs! **\* ELECTRIC ARTIST** — Manual: draw, erase, move as well as, Auto: draw, erase and move. Uses graphics bits not bytes. Saves drawing on tape or disk! **\* GALACTIC BATTLE** — The Swineus enemy have long range phasers but cannot travel at warp speed! You can, but only have short range phasers! Can you blitzkrieg the enemy without getting destroyed! Full graphics — real time! **\* WORD MANIA** — Can you guess the computer's words using your human intuitive and logical abilities? You'll need to, to beat the computer! **\* AIR COMMAND** — Battle the Kamikaze pilots. Requires split second timing. This is a FAST action arcade game.

ONLY \$12.95



**PACKAGE FOUR INCLUDES: LIFE** — This Z-80 machine language program uses full graphics! Over 100 generations per minute make it truly animated! You make your starting pattern, the computer does the rest! Program can be stopped and changes made! Watch it grow! **\* SPACE LANDER** — This full graphics simulator lets you pick what planet, asteroid or moon you wish to land on! Has 3 skill levels that make it fun for everyone. **\* GREED II** — Multi-level game is fun and challenging! Beat the computer at this dice game using your knowledge of odds and luck! Computer keeps track of his winnings and yours. Quick fast action. This game is not easy! **\* THE PHAROAH** — Rule the ancient city of Alexandria! Buy or sell land. Keep your people from revolting! Stop the rampaging rats. Requires a true political personality to become good! **\* ROBOT HUNTER** — A group of renegade robots have escaped and are spotted in an old ghost town on Mars! Your job as "Robot Hunter" is to destroy the pirate machines before they kill any more settlers! Exciting! Challenging! Full graphics!

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| PLACE | # | HORSE             | ODDS  | TIME    |
|-------|---|-------------------|-------|---------|
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| 4     | 4 | SEVTE HOT ROD     | 0.005 | 5.26316 |
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| 6     | 6 | UGLY JOES         | 0.005 | 3.94615 |
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**PACKAGE FIVE INCLUDES: SUPER HORSE RACE** — Make your bets just like at the real racetrack! 8 horses race in this spectacular graphic display! Up to 9 people can play! Uses real odds but has that element of chance you see in real life! Keeps track of everyone's winnings and losses. This is one of the few computer simulations that can actually get a room of people cheering! **\* MAZE MOUSE** — The mouse with a mind! The computer generates random mazes of whatever size you specify, then searches for a way out! The second time, he'll always go fastest route! A true display of artificial intelligence! Full graphics, mazes & mouses! **\* AMOEBA KILLER** — You command a one man submarine that has been shrunk to the size of bacteria in this exciting graphic adventure! Injected into the president's bloodstream, your mission is to destroy the deadly amoeba infection ravaging his body! **\* LOGIC** — This popular game is based on Mastermind but utilizes tactics that make it more exciting and challenging — has 2 levels of play to make it fun for everyone. **\* SUBMARINER** — Shoot torpedoes at the enemy ships to get points. Fast action graphics, arcade type game is exciting and fun for everybody!

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|-------|---|---|---|---|---|---|---|---|---|----|----|----|
| 1     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 2     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 3     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 4     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 5     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 6     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 7     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 8     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 9     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 10    | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 11    | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |
| 12    | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1  | 1  | 1  |

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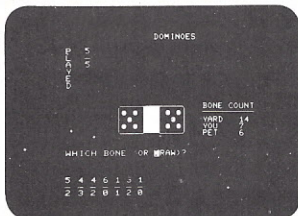
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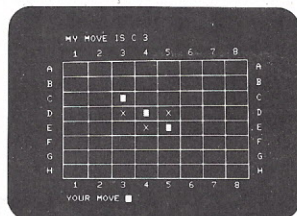


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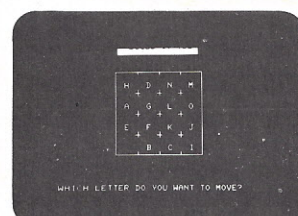
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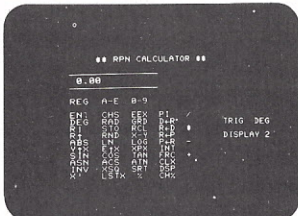
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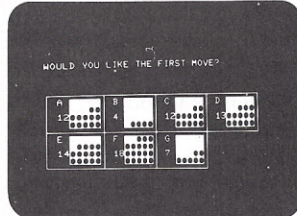
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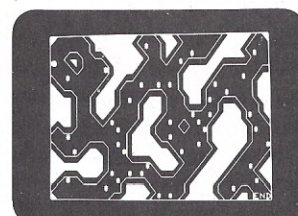
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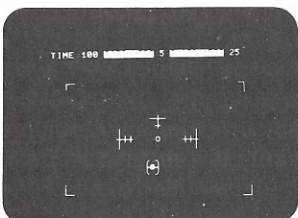
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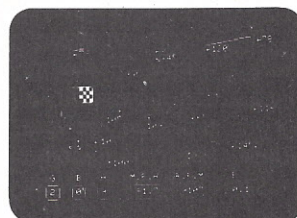
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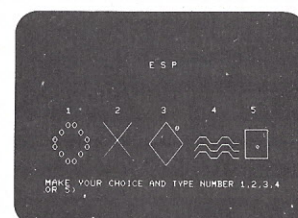
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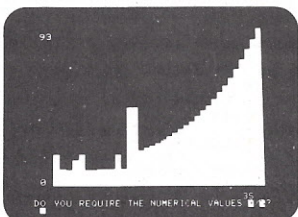
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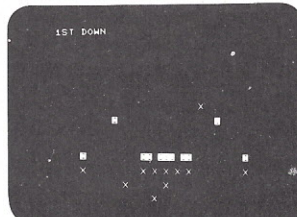
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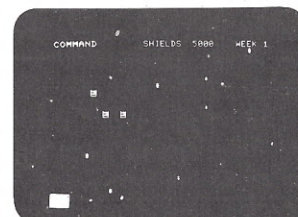
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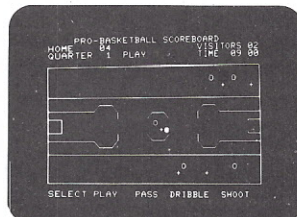
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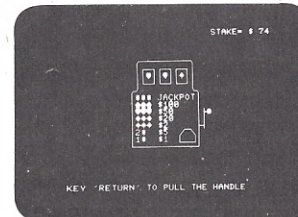
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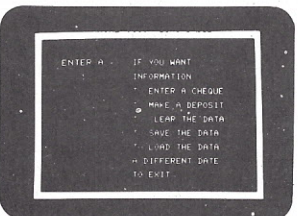
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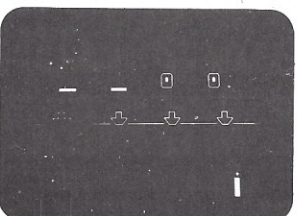
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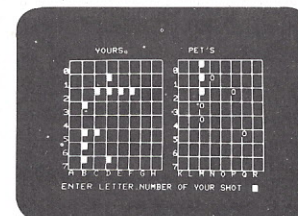
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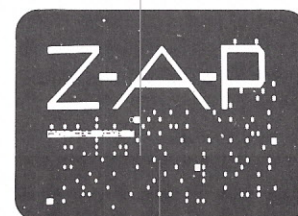
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## Can Computers Be Programmed to Be Conscious?

BY WILLIAM R. PARKS

(The following letter was recently received from K. Hvatum, P.O. Box 267, MIT Branch, Cambridge, MA 02129: "*You cannot rationally argue that a machine cannot be conscious! Man is made of the same atomic particles as machines. Assemble them one way and you have a human brain; assemble them another way and you have a computer. Sure, artificial intelligence research has a long way to go before anything approaching human intelligence can exist in a machine, but there are no fundamental limitations! A computer that could remember all past conversations with you and was aware of everything around it (i.e., it has microphones, cameras, etc.,) could be aware of all physical events, just like you! If it was 'programmed' to insist that it was conscious, who are you to deny it??? Amino acids are not intrinsically superior to pn junctions!!*" Professor Parks' column was received the very same day that the letter from MIT arrived. Can we cite this coincidence as an example of an ESP demonstration? Is this an act of spiritual conjuration? Will wonders never cease?)

Artificial intelligence is becoming an established field of computer science. The main areas of investigation are: computer systems that adapt to new situations or learn new things; pattern recognition or the ability of a computer to make decisions on the basis of visual data input through TV cameras; problem solving through a reasoning process driven by complex programs; simulation of natural systems; and heuristic methods where not all the possible solutions to a problem can be obtained.

While artificial intelligence as a field is growing — employing more and more researchers — there are many unanswered questions regarding the nature of artificial intelligence. And very few investigators have discussed the true meaning of this exciting field in relation to man on a philosophical level. We often become too involved with technical aspects of programming without giving much thought to their effects on man's understanding of himself. What, indeed, will man learn about himself as he creates highly intelligent computers which almost duplicate his very own powers of thought, learning, and discovery?

I offer a new phrase — "artificial consciousness"! I have already defined the meaning of "artificial intelligence" (a well established field) as consisting of actions and reactions made by a computer using human like approaches (see first paragraph). My definition of "artificial consciousness" is one that involves a central sense, or unity of

operation. The unit is aware of itself by means of "living" components physically attached to the hardware of its computer system.

As soon as you introduce a term such as "consciousness" to computer systems, you must speak of a hybrid system — one that contains non-living electronic components as well as "living" components. In the strict sense of the word, "consciousness" is not possible utilizing computers by themselves. You can attempt to simulate it. But no man can really expect the computer to be aware of itself and experience, in a "human way", what is going on in the physical world.

There is a great difference between "artificial intelligence" and "artificial consciousness". Consciousness requires a living component — the soul of its being. "Intelligence," per se, by itself does not require consciousness. Therefore, the sky's the limit when you are dealing with artificial intelligence! Anything man can do with his intelligent brain can be programmed into a computer! The consciousness that "man" experiences, however cannot be programmed into the hardware.

One thing being learned by man about man (as he studies computer technology and creates more complex and intelligent computer systems) is that he has something in common with the computer; that is, "intelligence". On the other hand, man has something the computer can never possess, "human" consciousness. Even if man

wanted to make a computer system "artificially conscious" he would have to add a living component to make it a hybrid system.

Has such a thing ever been done? The answer can be affirmative! It requires that you look upon programmers as the conscious component of a computer system. Programmers are the consciences of any intelligent systems they produce. Programmers are the souls of the process of computing because they are "aware" of what is going on within the systems they create.

We can therefore conclude that "artificial intelligence" is almost the same as "human intelligence". However, "consciousness" is not the same thing as computer intelligence. To repeat, consciousness is self-awareness. It is a central sense in man that makes him able to say, "I know that I know." A computer, on the other hand, may possess the representations of knowledge in the form of symbols; but it can never know that it knows. As a person — I can even "know that I know that I know!" (See if you can experience that. It requires some deep reflection!)

There are many striking similarities between the way computers think and the way men think. This is not surprising because it is men who program the computers. However, man is learning more about himself and the way he thinks as the computer revolution unfolds. He is learning, for one thing, that his thought patterns have been rather imperfect. Good programs today are exceeding man's ability in many areas of endeavor. For example, man has learned that a computer can think much faster than he can. It requires hundreds of instant decisions to launch a rocket. These decisions must be made within a second of "blast-off". Scientists at NASA have stated that without computers it would be impossible to launch a single complex missile today. We must now depend on computers not just as a luxury, but as a necessity. It's been estimated that if man had not invented



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## FUTURE COMPUTING

the computer — 70% of the population of the United States would be working for the government today just to process the forms needed to run a modern, highly complex and developed nation like ours. This is certainly one area where the computer is superior to man, (speed of operation of thought processes.) Man has learned something about himself from his invention of the computer. He has learned that he is a terribly "slow" thinker.

However, such a discovery should not discourage man. We can take joy in those areas of life that a computer will never reach. I refer to all the things we do that require human consciousness. When it comes to brute intelligence — the computer can certainly outperform us. But when it comes to those activities that require consciousness, we will always be superior. Here is a brief list (see if you can add more to the list, and let me know: 1) Experience joy. 2) Have hope. 3) Believe in someone (i.e. have faith.) 4) Love someone. 5) Experience the delights of Spring, such as walking in the sunshine, listening to the birds, seeing the flowers bloom again!

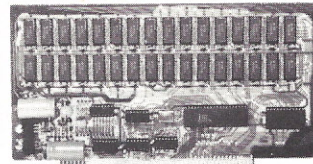
Perhaps man is learning from computers what *he* is best able to do. Whatever a computer can do better is not really suitable work for man. Activities that require consciousness are all suited for man in his work and in his destiny.

Future applications of artificial intelligence will help guide man into his true or proper work experience involving his "consciousness." And the computer will be guided into its true and proper role involving its "intelligence."



Professor Parks is in the Department of Mathematics and Computer Science at Fredonia State University College, Fredonia, NY.

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CIRCLE 14



# Basic Typesetter

—BY RICHARD R. GALBRAITH—

**H**ave you ever dreamed of having all your important typing look like it was part of a book, with even margins on both sides, neatly centered headings and cleanly numbered pages? A typesetting program for your microcomputer can give you these benefits and more. In this age of paperwork, the first impression your reports, letters and memos give can affect how you and your ideas are perceived. Whether you're trying to win a customer or impress a teacher, good looking typing will give you an edge.

Your hardware greatly affects the quality of your printing. No software package will let you print something on a model 33 Teletype which looks as good as a page from a Selectric.

Basic Typesetter was written for a TRS-80 with at least 16K memory and a single cassette attached to an Integral Data Systems IDS-125 dot matrix printer. Some of the options are based on the special control features for changing type size (from the standard 10 characters per inch to 8.3, 12 or 16.5 characters per inch) and for printing boldface (or enhanced) letters. If your printer does not offer these features, you'll have to omit several lines of code, but the main features are adaptable to any character printer.

I chose the dot matrix printer as a compromise. My minimum requirements for a printer were that it offer upper and lower case letters, accept regular paper and not cost much more than a thousand dollars. I also wanted it to print a normal page in under two minutes. A year ago, I couldn't find such a machine, but now several models meet these requirements, making word processing applications on a microcomputer feasible even for small-time moonlighters like me.

Basic Typesetter is designed to use text files created by Basic Typist (see

April 1980, *Personal Computing*). Like Basic Typist, Typesetter is easy to use, even for non-programmers. All of the options are determined by the user's responses to a series of prompts. Planning ahead is required for the special features. The easiest way to explain all of the options is to walk through the prompts in the order of their appearance.

## Typesetter Features

When you first enter "RUN", you are prompted to "prepare cassette and printer." Don't wait until you have entered all of your options before turning on the printer or you may miss the initial page numbering and control signals.

CONTINUOUS FORM (YES,NO)? If you answer "yes", the computer assumes you are using continuous paper (roll or fanfold) and prints the entire text without pausing. Otherwise, the program will pause at the end of each page to allow you to load a new sheet of paper. To minimize your typing effort, respond to any of the prompts asking for a word (YES,NO) by entering only the first letter: in this case "Y" or "N".

PAGE NUMBERS (YES,NO)? Answer "yes" and a page number will be typed on each page according to your further specifications. If you answer "no", the program will skip down to the next series of questions. The page numbering specifications are as follows: POSITION ON PAGE (TOP,BOTTOM)? If you specify "top", the page number will be printed where your paper is initially positioned, with two blank lines between it and the first line of text. The "bottom" option places the page number on line 57 (one-half inch below the normal bottom of text). The lines used for page numbers do not count towards the lines of text allowed per page, but are considered as part of the margin.

ALIGNED (CENTER,RIGHT,BOOK)? This specification allows you to have page numbers centered or aligned with the right hand margin of the text. The "book" option prints page numbers on the right-hand margin of odd numbered pages and on the left-hand margin of even numbered pages.

FORMAT (ALONE, PAGE, HYPHENS, ROMAN, LOWER ROMAN)? You can choose to have the page number simply printed alone, preceded by the word "page", enclosed in hyphens (example: -10-), or you can invoke the table of roman numerals (limited to the numbers one to one hundred in the program listing) using your choice of upper or lower case symbols (XVII or xvii).

FIRST PAGE #? If you're writing lengthy material, you may print a chapter at a time and start any section with the appropriate page number. PRINT ON FIRST PAGE (YES,NO)? If you're working by chapters or typing a thesis, you may wish to leave the page number off of the first page.

LINES PER PAGE (DEFAULT = 54)? The default length provides for one-inch margins at the top and bottom of an eleven-inch sheet of paper. However, you may specify any length you wish. The line count is based on vertical spacing (line feeds) and not actual text lines. Specifying 54 lines will allow 27 lines of double-spaced text (less if underlined headings are used). Also, the actual number of lines printed may be reduced if a new paragraph or heading falls at the bottom of a page. Instead of leaving a single line of a paragraph at the bottom of a page or printing a heading with no text immediately below it, the program will automatically save the material for the start of a new page.

Before the next prompt, the program reads the first record from the cassette, allowing special features to return to



the following prompts to change formats in the middle of a text.

The next set of prompts defines the format of each printed line. The prompt TYPE SIZE (8,10,12,16 CPI)? selects the size of the type face. And, LEFT MARGIN? lets you specify the left-hand margin in terms of print spaces. A little calculation is required here. My printer automatically provides a quarter-inch margin before the first print position, so to set a one-inch margin I need to specify 8 for 10 pitch type or 9 for 12 pitch type.

LINE LENGTH? If you want to avoid calculations, just press "enter" and the default value of a line six and one-half inches long will be provided. Don't worry about enhanced characters fouling up the length of your lines. Each enhanced character is counted as two print positions automatically. Another safety feature: Basic Typesetter will not let you print off the end of the page. If your options for type size, left margin and line length require more than the maximum eight inches of width allowed, the program will display an error message and let you try again.

SPACING (0=LETTER, 1=SINGLE, 2=DOUBLE, 3=TRIPLE)? determines the vertical spacing between lines. The "letter" format is single spaced, except a blank line is inserted between paragraphs. With RIGHT JUSTIFY (YES, NO)?, enough extra spaces will be distributed through the print line to provide an even right hand margin. This routine makes your typing look like it belongs in a book.

SPECIAL FEATURES (YES,NO, SAME)? You have finished the basic set of typesetting prompts. If you do not need any of the special features described below, you can shorten the prompting session and immediately proceed with printing your text. Use the "same" response in conjunction with the reformatting option partway through a text. After you change the type size or line length for the next section of type, you may continue printing with the remaining options left the same.

If you use the special features, you may specify a Tab stop, non-standard character set, a break point within the text, appending multiple text files into a continuous printing, special handling of up to four levels of headings embedded in the text, and special heading and footing messages to be printed on each page.

Basic Typesetter recognizes the shifted "at sign" (@) as a special Tab character. Unless otherwise specified,

the symbol will cause the next character to be printed in column 25 of your print line. However, you may set it to any value you wish. The Tab stop position is calculated from the first actual print position (the left hand margin is not counted). One word of caution: the special features assume that you know what you are doing and are not as care-

fully edited as the standard features. The program will allow you to specify a Tab stop that is larger than the maximum line length, even though that will foul up the printing routine.

CHARACTERS (0=STD, 1=CAPS 2=BOLD 3=BOLD CAPS)? If you do not want to use the full character set, you may have the text converted to all upper

## Sample Output

### TYPESETTER OUTPUT

THIS SAMPLE RUN ILLUSTRATES MANY OF THE FEATURES OF BASIC TYPESETTER, INCLUDING MULTIPLE TEXT FILE HANDLING. THIS OPENING PARAGRAPH IS FOLLOWED BY THE INSTRUCTIONS USED TO ILLUSTRATE THE BASIC TYPIST COMPONENT OF THIS WORD PROCESSING SYSTEM:

#### INTRODUCTION TO BASIC TYPIST

BASIC TYPIST is a Level II BASIC program which turns your TRS-80 into an electronic typewriter with text editing features. Lower case printing is provided without any hardware alteration to your TRS-80, though all letters will appear in upper case on the video display. With 32K of memory, you can store 500 lines of text (about 20 double spaced pages, or 28,000 characters) internally. 16K machines can handle approximately 200 lines of text at a time.

There are a few peculiarities of BASIC which must be considered when using the BASIC TYPIST. The comma and colon keys are used by Level II BASIC to identify the end of a variable or line; neither of them should be pressed when using BASIC TYPIST. BASIC TYPIST produces commas with the slash key, in the lower right hand corner of the key board. Colons will be typed when the 'up arrow' key is pressed. Spaces at the beginning of a line are ignored, so indentation is accomplished using the 'at sign'. Each 'at sign' indents five (5) spaces. Pressing the 'shift' and 'at sign' tabs to column 25, as shown on this line. The only other limitation is that quote marks (") may not be the first character on a line.

**Bold Face** type is obtained by enclosing the desired text between a 'less than' and a 'greater than' sign.

You type in text a line at a time, ending each line by pressing the 'ENTER' key. As you type, you may use the left arrow to correct any errors on the current line. Each line is limited to a maximum of 65 characters (to provide one inch margins on standard paper). If you attempt to enter a longer line, BASIC TYPIST will automatically truncate it at the end of a word and show you the shortened version of the line. Caution! Do not rely on this feature to properly shorten lines containing indentation or **Bold Face** type (since each bold face letter uses two print spaces). When you are finished entering text, type a line beginning with '##'. This will give you a choice of printing or editing or recording your text. You may also return to the entry mode to add more text on to the end of your work.

#### Printing

In the printing mode, you have the option of having your text printed with line numbers (useful for editing), or in standard single or double spaced lines. In all these cases, BASIC TYPIST will leave one inch margins at the top and bottom of each page, and will pause for you to load a new sheet of paper between pages.



## Figure 1 Data Dictionary

|         |                                                                                                                        |         |                                                                                                            |
|---------|------------------------------------------------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------------------------------|
| AS\$(n) | Input line from cassette file. n varies from 0 to 2.                                                                   | LW\$    | Line Work string: string used to supply characters for the current print line.                             |
| BF      | Bold Flag: indicates that current character will be printed in double width type.                                      | M       | Margin: calculated margin for centering.                                                                   |
| CF\$    | Continuous Forms: "Y" indicates that continuous forms are being printed.                                               | P       | Position: ASCII value for current letter — LP\$(n).                                                        |
| FB      | Format Bold: determines character set for printing.                                                                    | PA\$    | Page # Alignment: indicates horizontal position for page numbers.                                          |
| FC      | Format Column: Tab stop position for shifted "at sign".                                                                | PC      | Print Count: number of vertical print lines used on current page.                                          |
| FL      | Format Length: number of print positions per line.                                                                     | PF\$    | Page # Format: defines format for page numbering.                                                          |
| FM      | Format Margin: size of left margin (in print positions).                                                               | PN      | Page Number: for printing on current page.                                                                 |
| FP      | Format Page: number of lines per page (counts blank lines in double spacing, etc.)                                     | PN\$    | Page Numbers?: "Y" indicates page numbers are printed.                                                     |
| FS      | Format Spacing: vertical spacing on page.                                                                              | PO\$    | Page Option: indicates if page number is printed on the first page of text.                                |
| FT      | Format Type: type size (in characters per inch).                                                                       | PP\$    | Page # Position: vertical position (top or bottom) for printing page numbers.                              |
| HL      | Heading Level: defines level of heading (level is one less than the number of "less than" signs in front of the line). | RJ\$    | Right Justify: "Y" invokes text justification routine.                                                     |
| HP\$(n) | Heading Position: determines if heading will be centered (n is level number).                                          | RN\$(n) | Roman Numeral: Roman representation of number n.                                                           |
| HT(n)   | Heading Type: indicates character set used for heading.                                                                | SF\$    | Special Files: defines handling of multiple text files.                                                    |
| I,J,K   | Indices used as temporary counters.                                                                                    | SL      | Stop Line: defines break point in text file to stop printing and redefine the format.                      |
| KL      | Kount of Lines: number of lines used from input file.                                                                  | SP\$    | Special Features: controls the prompts for the special features.                                           |
| KR      | Kount Record: indicates current line in input buffer.                                                                  | T\$     | Temporary: string used for testing. Improves efficiency over multiple references to subscripted variables. |
| LC      | Line Characters: count of characters in current print line.                                                            | TB      | Title Bottom: line number for a page footing.                                                              |
| LK      | Line Kount: total number of lines on cassette file.                                                                    | TT      | Title Top: number of lines above body of text, for a page heading.                                         |
| LP\$(n) | Line Position: a single character position in the current print line.                                                  | TT\$(n) | Title Text: text of page heading (n=0) or page footing (n=1).                                              |
| LS      | Line Spaces: number of print position in current line.                                                                 | TU(n)   | Title type: character set for page heading or footing.                                                     |
|         |                                                                                                                        | TV\$(n) | Title position: defines horizontal alignment for page heading or footing.                                  |

case letters, or printed as all bold (double width) characters or both.

**STOP AT LINE #?** You can set a break point within a text file using the line number from a draft printed by Basic Typist. If you want the last portion of your text printed in fine print or all upper case, enter the number of the final line to be printed using the current options. After that line has been printed, the computer notifies you that "LINE # nn HAS BEEN PRINTED" then lets you enter new print options starting with "type size".

**MULTIPLE FILES (PAUSE,CONTINUE,NO)?** If you have not chosen to stop before the end of the text file, you can request that another file be appended

when the last line from the current text file is printed. When multiple files are used, they may continue using the same formatting options as the original file. Alternatively, the program will pause to accept new options starting with the "type size" prompt. In either case, you'll be prompted to prepare the cassette to read the new file when the end of the current file is reached.

### Headings

Basic Typesetter recognizes lines beginning with two or more "less than" symbols as headings. Ending each heading line with a "greater than" symbol lets you print your first drafts using Basic Typist and has your head-

ings appear as boldface print on the draft. You may use four different levels (1 through 4) of headings, starting heading lines with two to five consecutive "less than" symbols. You should define the print format for each level separately during the prompt session.

**HEADING LEVEL (1-4; 0 WHEN DONE)?** asks for the level of heading you wish to describe. The level number is one less than the number of "less than" symbols starting a line. This prompt is the start of a loop which repeats until you tell the computer you are finished defining or redefining headings by entering zero.

**LEFT,CENTERED — UNDERLINE?** The first letter of your response deter-



mines whether the heading will be centered or start at the left margin. If the final character of your response is a "U", the heading will be underlined. Underlining is produced by printing a string of hyphens on the line below the heading. The next prompt lets you specify the type set for the heading: 0=STD 1=CAPS, 2=LARGE, 3=LARGE CAPS 4=BOLD 5=BOLD CAPS? CAPS options cause all lower case letters to be shifted to print as upper case. "Large" options cause the headings to be printed at 8.3 characters per inch. "Bold" options use double width characters. This set of options applies to all levels of embedded headings.

PAGE HEADER (YES, NO)? determines if a message will be printed at the top of each page. If you answer "yes", you are prompted to enter HEADER TEXT? No character manipulation is performed on the page header text: Letters will be upper case unless shifted (the normal mode on TRS-80s) and colons or commas can be used only if the entire text string is enclosed in quotes. Typical page headings are the author's name, corporate propriety notice, or a banner (i.e., "Confidential" or "Final Draft"). Next, you specify LINES ABOVE BODY OF TEXT?. This count includes the line the header is printed on plus any blank lines between it and the first line of regular text. If both top page numbering and page headings are specified, the page number is printed first. Unlike page numbering, the lines used for the page heading are counted against the Lines Per Page limit.

You have a choice of five type faces for your page heading: 0=STD 1=SMALL 2=LARGE 3=BOLD 4=LARGE BOLD? The standard option uses the same print size as the rest of the text. The "small" option prints at 16.5

characters per inch, "large" options at 8.3 characters per inch, and "bold" options use double width characters. Alignment options are : LEFT, CENTERED, FRONT#, END#?, allowing you to center the message or start at the left hand margin. The FRONT# and END# options provide an alternate form of page numbering: they print the page number either immediately preceding or at the end of your heading message.

PAGE FOOTING (YES,NO)?, similar to the page heading feature, allows you to print a message at the bottom of each page. The processing, character size and format options are identical to those used for page headings. The one difference is that the vertical location is specified by LINE NUMBER? The line number given should be greater than the lines per page limit for the regular text.

By now, this large number of options probably has you a bit befuddled, but don't get discouraged. You can get excellent results for most typing jobs just using the standard options. When you want to get fancier, experiment with the other options until you develop a format that looks best to use. Then you can write down the parameters you used to serve as your normal standard.

### Technical Notes

Basic Typesetter uses more than 12,000 bytes of memory and 350 procedural statements. Frequently, the program listing has multiple statements per line. If you choose to write one statement per line, the memory requirements will be increased; also you must remember that all statements following an "IF" clause on a line are treated as a subroutine which is performed only when the "IF" clause is true.

The program is written using a mod-

ular structure which is identified by remarks in the program listing and diagrammed on the accompanying flow chart. The numbers on the flow chart refer to line numbers in the program listing.

The data dictionary (Figure 1) lists all the variables in alphabetical order to help you interpret the program. Figure 2 lists the special characters used by both Basic Typesetter and Basic Typist for transliterations and formatting. The printer control characters, which apply specifically to Integral Data Systems printers, are explained in Figure 3.

Text files for Basic Typesetter use the format written by Basic Typist. The first record contains the number of lines of text in the file. Each subsequent record contains three lines of text. End of file processing is determined by comparing the number of lines read to the value in the first record; there is no explicit end of file mark.

### Using Different Printers

Adapting Basic Typesetter for use on different printers, such as Radio Shack's Line Printer II, will require changing only those portions of the code which relate to type size and the use of bold, double-width characters. Also, you may wish to add new code to take advantage of any special formatting features offered by your printer.

For printers which do not allow you to change type size under software control, you must delete the "type size" option at line 300. A new line 300 simply specifies the fixed type size: "FT = n", where n is the type size in characters per inch. Eliminate the large type options from line 580. Other changes occur in the heading routines. Shorten lines 3100 and 3300 to eliminate the conditional LPRINTing of CHR\$(28) and eliminate subroutine 3120 to 3125 along with the references

Figure 2 Character Transliterations

| Key    | ASCII Values |     | Function                            |
|--------|--------------|-----|-------------------------------------|
|        | Old          | New |                                     |
| /      | 47           | 44  | Types as comma (,)                  |
| ↑      | 91           | 58  | Types as colon (:)                  |
| <      | 60           | 01  | Change to bold face or heading line |
| >      | 62           | 02  | Change back to normal type          |
| @      | 64           |     | Indentation: types 5 spaces.        |
| shift@ | 96           |     | Tab stop: tabs to pre-set column.   |

Figure 3 Printer Control Characters

| ASCII value | Changes Type Face to:             |
|-------------|-----------------------------------|
| 01          | Enhanced (double wide) characters |
| 02          | Normal (single wide) characters   |
| 28          | 8.3 characters/inch               |
| 29          | 10 characters/inch                |
| 30          | 12 characters/inch                |
| 31          | 16.5 characters/inch              |



to it (lines 3080 and 3340). Also eliminate the references to CHR\$(28) and CHR\$(31) and lines 3640, 3660, 3710 and 3720. Line 3760 then becomes a simple "RETURN" statement.

To use the enhanced characters on Radio Shack's Line Printer II, some change in the printing logic is required. I was told that it returns to normal print mode automatically at the end of every LPRINT statement. This function eliminates all of the "LPRINT CHR\$(02);" statements used by Basic Typesetter to return to the normal character spacing. On the other hand, the program will not function with the single character LPRINT commands used at line 1360 and 3240. The substitute logic is to bypass the character

printing when the bold flag (BF=1) is on and create a "Bold String" variable (BS\$). Initialize BS\$ to the null string (" ") at the start of a line and whenever the bold flag is turned on (by encountering the "less than" symbol). The character print command (line 1360) is replaced by "IF BF = 1 then BS\$ = BS\$+CHR\$(P) ELSE LPRINT CHR\$(P)". When the bold flag is turned off (by encountering the "greater than" symbol) or at the end of a line, then the boldface text can be printed using a "LPRINT CHR\$(14);BS\$;" command.

It would be impossible to itemize adaptations for all printer and micro-computer combinations on the market, especially since I couldn't even name

them all. These examples and figures should give you a good starting place for your own adaptations.

Adding simple word processing features offered by Typist and Typesetter should be worth the effort. It is important to record your text on clean tapes. One of my attempts to economize introduced a number of random typographical errors when I tried to print from a cheap cassette. Other than that set-back, I've reduced the time it takes to prepare a finished report. With Typesetter, my "typed" reports stand out from the rest of the pile. Your reports will catch the eye of a potential customer or your congressman's staff, impress a teacher, or get your reports discussed around the office. □

## Program Listing

```

10 REM          BASIC TYPESETTER
11 REM
15 REM
20 REM  BY R. GALBRAITH          JULY 1979
21 REM
22 REM
25 REM
48 REM
49 REM*** INITIALIZATION ***
50 CLEAR3000:DIMA$(2):DIMLP$(200):DIMHP$(4):DIMHT(4):DIMTT$(1):DIMTU(1):DIMTV$(1)
:DIMRN$(100)
60 HP$(0)="L":HT(0)=4
80 CLS:PRINTTAB(12)"BASIC TYPESETTER":PRINT
90 PRINT"PREPARE CASSETTE & PRINTER":PRINT
98 REM
99 REM*** DEFINE PAGE FORMAT ***
100 INPUT"CONTINUOUS FORM (YES/NO)";CF$
110 INPUT"PAGE NUMBERS (YES/NO)";PN$:IF LEFT$(PN$,1)="N"THEN PP$="N":GOTO170
120 INPUT"POSITION ON PAGE (TOP/BOTTOM)";PP$
130 INPUT"ALIGNED (CENTER/RIGHT/BOOK)";PA$
140 INPUT"FORMAT (ALONE/PAGE/HYPHENS/ROMAN/LOWER ROMAN)";PF$:PF$=LEFT$(PF$,1):IF
PF$=""THEN PF$="A"
145 IFFP$="R"ORPF$="L"GOSUB4990
150 INPUT"FIRST PAGE #";PN$:IF PN<1 THEN PN=1
160 INPUT"PRINT ON FIRST PAGE (YES/NO)";PO$
170 INPUT"LINES PER PAGE (DEFAULT = 54)";FP$:IF FP<6 THEN FP=54
180 IF LEFT$(PP$,1)="T"THEN J=999 ELSE J=0
190 PRINT"READING FIRST TAPE RECORD"
200 INPUT$-1,LK:KL=1:KR=9
230 IF LS>FL THEN 1250
298 REM
299 REM*** DEFINE LINE FORMAT ***
300 INPUT"TYPE SIZE (8,10,12,16 CPI)";FT$:IF FT=8 THEN LPRINT CHR$(28);ELSE IF FT=
12 THEN LPRINT CHR$(30);ELSE IF FT=16 THEN LPRINT CHR$(31);ELSE LPRINT CHR$(29):F
T=10
310 INPUT"LEFT MARGIN";FM
320 INPUT"LINE LENGTH";FL$:IF FL<10 THEN FL=6.5*FT
325 IF(8*FT)<(FM+FL) PRINT"** LINE TOO LONG FOR PAGE **":GOTO300
330 IF J=999 GOSUB1600:LPRINT:LPRINT
340 INPUT"SPACING (0=LETTER, 1=SINGLE, 2=DOUBLE, 3=TRIPLE)";FS$:IF FS>3 THEN 340
350 INPUT"RIGHT JUSTIFY (YES/NO)";RJ$:RJ$=LEFT$(RJ$,1)
358 REM
359 REM*** DEFINE SPECIAL FEATURES ***

```

*Continued*



```

360 INPUT"SPECIAL FEATURES (YES/NO/SAME)";SP$:IF LEFT$(SP$,1)="Y" THEN 400
365 IF LEFT$(SP$,1)="S" THEN SL=999:GOTO1100
370 SF$="N":SL=999:FB=0:BF=0:FC=25:GOTO1100
400 INPUT"TAB STOP";FC:IF FC<1 THEN FC=25
410 INPUT"CHARACTERS (0=STD, 1=CAPS, 2=BOLD 3=BOLD CAPS)";FB:IF FB>4 THEN 410
420 IF FB>1 THEN BF=1 ELSE BF=0
430 INPUT"STOP AT LINE #";SL:IF SL<KL THEN SL=999 ELSE 500
440 INPUT"MULTIPLE FILES (PAUSE/CONTINUE/NO)";SF$
500 INPUT"HEADING LEVEL (1-4; 0 WHEN DONE)";HL:IF HL<1 OR HL>4 THEN 550
510 INPUT"LEFT/CENTERED -- UNDERLINE";HP$(HL)
520 INPUT"0=STD 1=CAPS 2=LARGE 3=LARGE CAPS 4=BOLD 5=BOLD CAPS";HT$(HL)
530 GOTO500
550 INPUT"PAGE HEADER (YES/NO)";TT$(0):IF LEFT$(TT$(0),1)="N" THEN TT=0:GOTO 600
560 INPUT"HEADER TEXT";TT$(0)
570 INPUT"LINES ABOVE BODY OF TEXT";TT:IF TT<1 THEN 570
580 INPUT"0=STD, 1=SMALL 2=LARGE 3=BOLD 4=LARGE BOLD";TU(0):IF TU(0)>4 THEN 580
590 INPUT"LEFT/CENTERED/FRONT#/END#";TV$(0):TV$(0)=LEFT$(TV$(0),1)
595 IF TV$(0)="F"OR TV$(0)="E"THEN INPUT"FIRST PAGE #";PN
600 INPUT"PAGE FOOTING (YES/NO)";TT$(1):IF LEFT$(TT$(1),1)="N"THEN TB=0:GOTO 1100
610 INPUT"FOOTING TEXT";TT$(1)
620 INPUT"LINE NUMBER";TB:IF TB<=FP:PRINT"LINE NUMBER MUST BE GREATER THAN";FP:GOTO
620
630 INPUT"0=STD, 1=SMALL 2=LARGE 3=BOLD 4=LARGE BOLD";TU(1):IF TU(1)>4 THEN 6
30
640 INPUT"LEFT/CENTERED/FRONT#/END#";TV$(1):TV$(1)=LEFT$(TV$(1),1)
645 IF TV$(1)="F"OR TV$(1)="E"THEN INPUT"FIRST PAGE #";PN
660 IF TT>0 GOSUB 3500
1097 REM
1098 REM
1099 REM*** BUILD PRINT BUFFER ***
1100 IF KL>LK THEN 1900 ELSE IF KL>SL THEN 1800 ELSE IF KR>2 GOSUB 2000
1110 IF LEN(LW$)>FL THEN 1150
1120 IF LEN(LW$)=0 THEN LW$=A$(KR):KR=KR+1:KL=KL+1:GOTO 1100
1122 IF LEN(LW$)>1 IF LEFT$(LW$,2)("<"GOSUB 3000:LW$="":GOTO 1100
1125 IF LEN(A$(KR))=0 OR A$(KR)=" "THEN KR=KR+1:KL=KL+1:GOTO 1100
1130 T$=LEFT$(A$(KR),1):IF T$="@"OR T$="`"THEN 1150
1135 IF T$="<"THEN IF LEFT$(A$(KR),2)("<"THEN 1150
1140 LW$=LW$+" "+A$(KR):KR=KR+1:KL=KL+1:IF LEN(LW$)<FL THEN 1100
1150 GOSUB1200:GOTO1100
1198 REM
1199 REM*** BUILD PRINT LINE ***
1200 LS=0:LC=0:FOR I=1 TO LEN(LW$)
1210 LP$(1)=MID$(LW$,I,1):LC=LC+1:T$=LP$(I)
1220 IF T$=">"THEN GOSUB 2100 ELSE IF T$="@"THEN 2110 ELSE IF T$="`"THEN 2120 EL
E IF T$="<"THEN BF=1:GOTO 1230
1225 IF BF=1 THEN LS=LS+2 ELSE LS=LS+1
1230 IF LS>FL THEN 1250
1240 NEXTI:LW$="":GOTO1300
1250 FOR I = LC TO 2 STEP -1:T$=LP$(I):IF T$=" "OR T$="@"OR T$="`"THEN 1260 ELSE
IF T$="<"THEN GOSUB 2100 ELSE IF T$=">"THEN BF=1 ELSE NEXT I:I=LC+1:GOTO 1270
1255 NEXTI
1260 J=1+LC-I:LC=I-1:IF BF=1 THEN LS=LS-2*J ELSE LS=LS-J
1270 IF LC>LEN(LW$) THEN LW$=" "ELSE LW$=RIGHT$(LW$,LEN(LW$)-I):IF LEFT$(LW$,1)="
"THEN LW$=RIGHT$(LW$,LEN(LW$)-1)
1280 IF LEFT$(RJ$,1)="Y"GOSUB 2200
1298 REM
1299 REM*** PRINT FORMATTED LINE ***
1300 IF FS=0 AND LP$(1)="@ THEN LPRINT:PC=PC+1
1302 IF FP-PC<4 THEN IF LP$(1)="@GOSUB 1500
1305 LPRINT CHR$(02);TAB(FM);:IF BF=1 LPRINT CHR$(01);
1310 FOR I=1 TO LC:P=ASC(LP$(I))
1315 IF FB=0 OR FB=2 THEN IF P<91 AND P>64 THEN P=P+32:GOTO 1360
1320 IF P<123 AND P>96 THEN P=P-32:GOTO 1360
1330 IF P=96 LPRINT TAB(FM+FC-1)" ";:GOTO 1370
1340 IF P=64 LPRINT" ";:GOTO 1370
1350 IF P=47 THEN P=44 ELSE IF P=91 THEN P=58 ELSE IF P=60 THEN P=01 ELSE IF P=62
AND FB<2 THEN P=02:BF=0
1360 LPRINT CHR$(P);
1370 NEXT I:LPRINT:PC=PC+1:IF FS>1 THEN LPRINT:PC=PC+1
1380 IF FS=3 THEN LPRINT:PC=PC+1

```



## Program Listing continued

```

1390 IF PC>=FP GOSUB 1500
1395 RETURN
1497 REM
1498 REM
1499 REM*** END OF PAGE ROUTINE ***
1500 IF TB>0 GOSUB 3550
1505 IF LEFT$(PP$,1)="N" THEN 1520 ELSE PC=PC+3
1510 IF LEFT$(PP$,1)="B" THEN J=56-PC:FOR I=1 TO J:LPRINT:GOSUB 1600
1520 PN=PN+1:J=65-PC:IF J>0 THEN FOR I=1 TO J:LPRINT:NEXT I
1530 IF LEFT$(CP$,1)<>"Y" INPUT "LOAD NEXT PAGE";Z$:CLS
1540 IF LEFT$(PP$,1)="T" GOSUB 1600:LPRINT:LPRINT
1550 PC=0:IF TT>0 GOSUB 3500
1560 RETURN
1598 REM
1599 REM*** PRINT PAGE NUMBER ***
1600 IF LEFT$(PO$,1)="N" THEN LPRINT:PO$="Y":RETURN
1610 I$=LEFT$(PF$,1):IF T$="P" THEN J=5 ELSE IF T$="H" THEN J=4 ELSE J=1
1620 IF PN<10 THEN J=J+1 ELSE IF PN<100 THEN J=J+2 ELSE J=J+3
1630 IF LEFT$(PA$,1)="C" THEN I=(FL-J)/2+FM ELSE IF LEFT$(PA$,1)="B" AND PN/2=INT(
PN/2) THEN 1670 ELSE I=FL+FM-J
1635 IF I$="L" THEN RN$(PN)=CHR$(ASC(RN$(PN))+32):T$="R"
1640 LPRINT CHR$(02);STRING$(I," ");:IF T$="P" THEN LPRINT "Page";PN ELSE IF T$="H
" THEN LPRINT "-";PN; "-" ELSE IF T$="R" THEN LPRINT RN$(PN) ELSE LPRINT PN
1650 RETURN
1670 IF I$="A" THEN I=FM-1 ELSE I=FM
1675 GOTO 1635
1798 REM
1799 REM*** BREAK ON LINE NUMBER ***
1800 IF LEN(LW$)>0 GOSUB 1200:GOTO 1800
1810 PRINT "LINE #";SL;"HAS BEEN PRINTED":GOTO 3000
1898 REM
1899 REM*** BREAK AT END OF FILE ***
1900 IF LEN(LW$)>0 GOSUB 1200:GOTO 1900
1910 PRINT "FILE PRINTED":IF LEFT$(SF$,1)="C" THEN 1920 ELSE IF LEFT$(SF$,1)="P" THE
N 200 ELSE GOSUB 1500:GOTO 9999
1920 INPUT "READY TO CONTINUE (YES/NO)";Z$:IF LEFT$(Z$,1)="N" GOSUB 1500:GOTO 9999
1930 INPUT I-1,LK:KL=1:KR=3:GOTO 1100
1998 REM
1999 REM*** READ FROM CASSETTE ***
2000 INPUT I-1,A$(0),A$(1),A$(2):KR=0:RETURN
2098 REM
2099 REM*** TRANSLITERATIONS ***
2100 IF FB<2 THEN BF=0
2105 RETURN
2110 IF BF=1 THEN LS=LS+10 ELSE LS=LS+5
2115 GOTO 1230
2120 IF LS<FC THEN LS=FC ELSE LP$(I)=" ":LS=LS+1
2125 GOTO 1230
2198 REM
2199 REM*** RIGHT JUSTIFICATION ***
2200 J=FL-LS:K=J:IF J<1 RETURN
2205 M=LC:LC=LC+J
2210 FOR I=M TO 1 STEP -1:IF LP$(I)=" " OR LP$(I)="@" GOSUB 2270:IF J=0 RETURN
2220 LP$(I+J)=LP$(I):NEXT I:M=M+K-J:IF J=K RETURN
2225 K=J
2230 FOR I=1 TO M:IF LP$(I+J)=" " OR LP$(I+J)="@" GOSUB 2280:IF J=0 RETURN
2240 LP$(I)=LP$(I+J):NEXT I:M=M+K-J:K=J:GOTO 2210
2270 LP$(I+J)=" ":J=J-1:RETURN
2280 LP$(I)=" ":I=I+1:J=J-1:RETURN
2998 REM
2999 REM*** PRINT HEADING LINE ***
3000 J=LEN(LW$):IF RIGHT$(LW$,1)=">" THEN J=J-1:LW$=LEFT$(LW$,J)
3010 IF LEFT$(LW$,5)="<<<<<" THEN HL=5 ELSE IF LEFT$(LW$,4)="<<<<" THEN HL=4 ELSE I
F LEFT$(LW$,3)="<<<" THEN HL=3 ELSE HL=2
3020 J=J-HL:LW$=RIGHT$(LW$,J):HL=HL-1:IF FS=0:LPRINT:PC=PC+1
3030 IF FP-PC<8 GOSUB 1500
3040 IF LEFT$(HP$(HL),1)="C" THEN 3300

```



```

3050 LPRINT CHR$(02);:LPRINT TAB(FM);:GOSUB 3100
3060 GOSUB 3200:LPRINT CHR$(02);
3070 IF RIGHT$(HP$(HL),1)="U" LPRINT TAB(FM);:GOSUB 3100:GOSUB 3140
3080 IF HT(HL)>1 AND HT(HL)<4 GOSUB 3120
3090 GOTO 3150
3100 IF HT(HL)>3 THEN LPRINT CHR$(01);ELSE IF HT(HL)>1 THEN LPRINT CHR$(28);
3105 RETURN
3120 IF FT=16 LPRINT CHR$(31);ELSE IF FT=12 LPRINT CHR$(30);ELSE IF FT=10 LPRINT
CHR$(29)
3125 RETURN
3140 LPRINT STRING$(J,"-");PC=PC+1:RETURN
3150 IF FS>1 THEN LPRINT:PC=PC+1;IF FS>2 THEN LPRINT:PC=PC+1
3155 RETURN
3200 FOR I=1 TO J:P=ASC(MID$(LW$,I,1));IF P=91 THEN P=58 ELSE IF P=47 THEN P=44
3210 IF P>96 AND P<123 THEN P=P-32:GOTO 3240
3220 K=HT(HL):IF K=1 OR K=3 OR K=5 THEN 3240
3230 IF P<91 AND P>64 THEN P=P+32
3240 LPRINT CHR$(P);:NEXT I
3245 IFFB<2 THEN BF=0
3250 LPRINT:PC=PC+1:RETURN
3299 REM--Centering Subroutine
3300 IF HT(HL)>3 THEN M=FM/2+FL/4-J/4 ELSE IF HT(HL)<2 THEN M=(FL-J)/2+FM ELSE M=
35-(J/2):LPRINT CHR$(28);
3310 IF HT(HL)>3 LPRINT CHR$(01);ELSE LPRINT CHR$(02);
3320 LPRINT TAB(M);:GOSUB 3200
3330 IF RIGHT$(HP$(HL),1)="U" LPRINT TAB(M-2);:GOSUB 3140
3340 IF HT(HL)<4 AND HT(HL)>1 GOSUB 3120
3350 GOTO 3150
3498 REM
3499 REM*** PRINT PAGE HEAD/FOOT ***
3500 K=0:GOSUB 3600:PC=TT
3510 IF TT>1 THEN FOR I=2 TO TT:LPRINT:NEXT I
3520 RETURN
3550 K=1:J=TB-PC:IF J>1 THEN FOR I=2 TO J:LPRINT:NEXT I
3560 IF TB>PC THEN PC=TB ELSE PC=PC+1
3600 IF TV$(K)="C" THEN 3700
3610 LPRINT TAB(FM);:IF TU(K)=1 THEN LPRINT CHR$(31);ELSE IF TU(K)=2 THEN LPRINT
CHR$(28);ELSE IF TU(K)=3 THEN LPRINT CHR$(01);ELSE IF TU(K)=4 THEN LPRINT CHR$(01
);:LPRINT CHR$(28);
3620 IF TV$(K)="F" THEN LPRINT PN;
3630 LPRINT TT$(K);:IF TV$(K)="E" THEN LPRINT PN ELSE LPRINT
3640 IF TU(K)=0 OR TU(K)=3 THEN RETURN
3660 IF FT=16 THEN LPRINT CHR$(31);ELSE IF FT=12 THEN LPRINT CHR$(30);ELSE IF FT=
8 THEN LPRINT CHR$(28);ELSE LPRINT CHR$(29);
3670 RETURN
3699 REM-- Centering Subroutine
3700 J=LEN(TT$(K));IF TU(K)>2 THEN J=2*J:LPRINT CHR$(01);
3710 IF TU(K)=1 THEN M=66-(J/2):LPRINT CHR$(31);:GOTO 3750
3720 IF TU(K)=2 OR TU(K)=4 THEN M=35-(J/2):LPRINT CHR$(28);:GOTO 3750
3730 M=(FL-J)/2+FM
3750 LPRINT TAB(M)TT$(K)
3760 IF TU(K)=0 OR TU(K)=3 THEN RETURN ELSE GOTO 3660
4988 REM
4989 REM*** ROMAN NUMERAL TABLE ***
4990 RESTORE:FOR I=1 TO 100:READ RN$(I):NEXT I:RETURN
5000 DATA I,II,III,IV,V,VI,VII,VIII,IX,X
5010 DATA XI,XII,XIII,XIV,XV,XVI,XVII,XVIII,XIX,XX
5020 DATA XXI,XXII,XXIII,XXIV,XXV,XXVI,XXVII,XXVIII,XXIX,XXX
5030 DATA XXXI,XXXII,XXXIII,XXXIV,XXXV,XXXVI,XXXVII,XXXVIII,XXXIX,XL
5040 DATA XLI,XLII,XLIII,XLIV,XLV,XLVI,XLVII,XLVIII,XLIX,L
5050 DATA LI,LII,LIII,LIV,LV,LVI,LVII,LVIII,LIX,LX
5060 DATA LXI,LXII,LXIII,LXIV,LXV,LXVI,LXVII,LXVIII,LXIX,LXX
5070 DATA LXXI,LXXII,LXXIII,LXXIV,LXXV,LXXVI,LXXVII,LXXVIII,LXXIX,LXXX
5080 DATA LXXXI,LXXXII,LXXXIII,LXXXIV,LXXXV,LXXXVI,LXXXVII,LXXXVIII,LXXXIX,
XC
5090 DATA XCI,XCII,XCIII,XCIV,XCV,XCVI,XCVII,XCVIII,XCIX,C
9999 END

```



# APF's Imagination Machine

BY DAVID B. POWELL

**S**earch your imagination. Build your perfect computer. What would it be like?

If you are completely new to the home computer field;

If your child wants a computer to play games, but you want a machine to teach that computers can do more;

If, for any reason, you want an introductory system fairly capable, but not dazzling, in its Basic programming, music, graphics and games talents;

If you want a machine that acts like a computer, but still slides into the beginning hobbyist's price range (about half that of an Apple), then the APF Imagination Machine may match your imaginary ideal.

Long-time hobbyists, hardware experts and programming language purists would probably be happier with a higher-level machine. But, for the beginner, APF Electronics' first Imagination Machine (called IM-1) offers games in color, limited music output, some graphics and a functioning Basic of the company's own design. The IM-1 is available now; the supplier claims production runs of 2000 units per day. By September, APF hopes to offer its IM-2 expanded version. More on this later.

## Hardware: "Some assembly required"

The IM-1 comes shipped in two components: computer console and MP1000 game controller. These have to be assembled to make a working system... and it's best not to delegate this chore to the youngest family members.

The computer console offers 8K of RAM, a 53-key typewriter-style keyboard, integral cassette tape input/output deck (with six control keys and tape counter), built-in sound synthesizer, audio speaker, volume control and microphone input port. One nice design feature: a template above the keyboard points the way to single-key

*Dave Powell is managing editor of PC's sister publication Minicomputer News.*



entry of 24 Basic commands.

A cavity in the computer console accepts the MP1000 game console, which the company has sold, and will continue to sell alone, to the tv-games-only market. The game console incorporates two 4-direction hand-held joy stick units with numerical keypads and "Fire Buttons." This game console contains an additional 1K of RAM, giving the complete system 9K.

In an interesting example of adaptive marketing, APF has designed their system so the customer can't have his computer without buying the game console. The two must be joined before the computer will work. This is because the computer console holds the slot for solid-state Basic and game cartridges while the game console connects with the tv output. In this way the company boosts sales of its older games-only device.

Assembling APF's Imagination Machine, version IM-1, was not an easy task. The instructions were easy enough and illustrations clarified difficult points. But the customer must tackle a tricky little job that should have been done in the factory: joining the game and computer consoles.

To accomplish this, the user must insert a fragile metal "grounding clip" into a deep cavity in the MP1000 console. The tool I received for doing this (a plastic knife) proved totally inadequate for the job. APF's technical specialist, Ed Smith, said this was an old

version of the tool that should not have been sent out. The new tool he described sounded like it could handle the job. I asked for one, for inspection and test, but it never came.

Again, the factory should insert at least the grounding clip, if not the computer-game console connector piece. And, if Smith has his way, when APF introduces its IM-2 version this fall, both consoles will be connected before shipping. Apparently many customers have complained about the problem.

At the time of this writing, APF offers no peripherals for the IM-1. But, by April, the company hopes to offer floppy-disk, printer, memory expansion and communications modem additions. APF will buy these, rather than build, according to Smith. And suppliers have not been decided. But Smith did confess he would like to offer Shugart Minifloppy disk drives for the IM-2 version by next year.

All peripherals will plug into a "building block" addition to the IM-1 system. The building block will handle up to four devices and will include an RS-232 connector.

Without the promised peripherals, however, the Imagination Machine cannot handle hard-copy output, file management, data bases or applications requiring high-speed mass storage. Users should not expect such capabilities without the peripherals.



## Software that plugs in and reels out

Present APF software comes in both audio cassettes and plug-in ROM cartridges. Cassettes contain the more "business-like" offerings, such as Typing Tutor; Math Tutor; Checkbook/Budget Manager; Personal Business Machine; Budget Manager II; Bar Charts; Electronic Files; Space, Size and Surface Guide; Basic Tutor; Artist and Easel and Music Composer/Player Piano. Solid state cartridges contain games and APF's home-grown 12K Basic.

Fitting the needs of the Imagination Machine's target audience, the cassette software offerings, at least those reviewed, function at the home-user rather than computer-pro level. For more on these, see the cassette software sidebar.

For game players APF offers quite a few ROM cartridges. These include Backgammon, Baseball, Casino I, Blackjack, Boxing, Brickdown/Shooting Match, UFO I/UFO II/Sea Monster/Break it Down/Rebuild/Shoot a Little/Shoot/Shoot a Lot and Pinball/Dungeon Hunt/Blockout. For more information on these, see the games sidebar.

Also in a solid-state ROM cartridge is APF's home-grown Basic language, the only language now offered or planned for the near future. The language is definitely functional, with enough commands to give the first-time user a good idea of what programming is all about. But the language purist who compares all Basics with Microsoft's will probably come away grumbling. APF's Basic just has too many non-standard idiosyncrasies.

For example, there is no RESUME or CONTINUE command. After interrupting a program, one must begin execution again with a fresh program RUN. One cannot yet take up execution at the break point. According to Smith this may be corrected in the IM-2 version.

Another quirk: the Imagination Machine's Basic requires predefined string lengths; no variable lengths are allowed. An interesting result of this, and something to guard carefully against when programming the computer, occurs when manipulating two strings of unequal length. For example, if one reads a string of length two (say "AB") into a variable that previously held a three character string "123", then prints what that variable *now* holds, the result ("AB3") will retain the last character of the old value. For

this reason, in a logical comparison of the strings "AB" and "ABC", the computer will see them as equal, as it would "AB" and "ABC123".

Also, the APF Basic does not recognize an end-of-data condition when reading from a DATA statement. The system simply wraps around to the first data in the statement and recycles through the data until the READ statement is no longer executed.

There are other things guaranteed to send the programming pro mumbling to the showers, such as no accuracy beyond four decimal places and no scientific notation to circumvent that problem. However, according to Smith, these should both be corrected in the IM-2.

But the first-time user that represents APF's market probably would not care about most of these objections. What he probably wants is enough language commands to balance his checkbook and manipulate the family budget. And this APF Basic provides.

It also provides music.

This capability may not send experienced compiler writers into joyous cartwheels, but, for the beginning computerist and his family, music can be very entertaining. By entering the MUSIC command followed by a string of symbols, the user can make the machine play any tune within a three-

## APF Price List

|                               |                |
|-------------------------------|----------------|
| MP1000 game console . . . . . | \$129.95       |
| Computer Console . . . . .    | 499.95         |
| Building Block . . . . .      | 199.95         |
| 8K RAM Addition . . . . .     | 99.95          |
| Floppy Interface . . . . .    | 199.95         |
| Mini Floppy . . . . .         | 349.95         |
| Printer . . . . .             | 399.95         |
| Modem . . . . .               | 199.95         |
| Basic ROM Cartridge . . . . . | 49.95          |
| Game Cartridges and           |                |
| Cassette Programs . . .       | 19.95 to 29.95 |

octave range (including sharps and flats). Notes can be held, or pauses inserted between, to create rhythm.

One doesn't have to buy a synthesizer board to play music, either. The computer includes its own synthesizer and speaker.

There is, however, one limitation. No two notes may sound at once, limiting electronic composers to melodies without harmony. Unless they hum.

Another set of commands built in to APF's Basic provide limited graphics capability. The user will have to develop some programming skill before attempting to plot graphs or bar charts.

However, APF Basic better suits the computer artist. In low resolution, the user may load any of 16 "shapes" (in any of eight colors) into any of 512 cells

## Cassette Software

### Typing Tutor

This offers both lessons and tests. The computer monitors the user's response speed and accuracy and chooses exercises accordingly.

### Math Tutor

This very basic tape is for the youngest users. It offers illustrated arithmetic facts and tests.

### Checkbook/Budget Manager

A year's checks are letter-coded and the amounts entered for later recall.

### Electronic Files

This is basically a mailing list maintenance package.

### Space, Size and Surface Guide

Given dimensions, areas to be covered and left uncovered, this calculates material requirements and costs for such projects as wall papering, painting, paneling and tiling. Cost differ-

ences are compared for differently priced products. Extra materials required for wastage are taken into account.

### Personal Business Machine

Users may compute loan amortization, interest and principal payments and interest rates. The program will calculate to the penny how much may be saved by paying off a loan early. Profits on investments are also calculated.

### Basic Tutor

This should overcome the limitations of the programming documentation provided with the system. Exercises on the cassette combine with illustrations in a guide book. Users can choose areas to be covered.

### Music Box/Player Piano

About the only capability this adds to the APF Basic's own music capability is creating pictures to accompany songs.



(32 columns by 12 rows) on the output screen. "Shapes" are built from a 2-by-2 square matrix by "illuminating" all permutations of the four quadrants. So, if one counts the four quadrants making up each allowable shape, APF low resolution is 64 by 32, although each point is not individually addressable.

Low resolution graphics commands also allow one to draw horizontal and vertical lines, clear the screen, locate and position cursors, produce reverse video (to and from black-on-orange) and determine the shape contained in any screen cell.

High resolution is produced similarly to low, by loading shapes into screen cells. With a 32 by 12 array of cells, and 4-by-16-dot shapes, effective high resolution is 128 by 192 dots. Again, these are not individually addressable. Two sets of four colors may be used, placing eight colors on the screen.

According to Smith, one-color graphics are available in 256 by 192 resolution. An APF Basic technical reference manual, in the works, will tell how to implement it and how to create charts and bar graphs, he added.

### **Documentation: Light now**

Imagination Machine documentation is not very extensive, but the supplier's intended target audience might hesitate to slog through inch-thick reference manuals. The two pieces provided (Owner's Manual and Basic Language Reference Manual) each weigh in at under 25 pages.

This is fine for the Owner's Manual. It adequately leads the user through machine assembly and checkout, through ROM cartridge loading procedures, cassette tape loading, saving programs on cassette, computer care and simple troubleshooting. However, the section on writing Basic programs provides so little instruction or explanation that it really doesn't live up to its intent.

One would hope the Basic Language Reference Manual provided more instruction in the programming arts. But it didn't. It simply listed all allowable commands and their functions. More detail is given on music, graphics and tape commands. But, the user taking his first dip into computerdom is not left in total darkness. A cassette-tape course, Basic Tutor, provides step-by-step programming instruction. And again, APF should very soon begin shipping its technical documentation, covering both hardware and software in more detail.

### **A buy for some**

APF Electronics' Imagination Machine is not for the computer pro. The supplier knows this and makes no pretense of targeting to the business market. But, for the home user of any age who wants a painless introduction to

"his first computer," the \$500-IM-1 should be considered. And the IM-2 with peripherals and improved Basic, could be quite a buy.

APF Electronics Inc., is located at 444 Madison Ave., New York, NY 10022; (212) 758-7550. □

## **Game Cartridges**

### **Backgammon**

I tried this one out on some of my Backgammon-playing friends. They found, as did I, that either the computer doesn't play according to generally accepted rules or the instructions are not sufficiently clear. Whichever, getting into a game always proved very difficult. All comers preferred board and dice cups.

### **Baseball**

This worked. Getting the right english on the ball and timing the swing provided more than enough challenge. Graphics were decent; the little stick-figure players were recognizable. It's always disconcerting when the computer wipes your team off the field with a triple play, then gloats about it.

### **Casino I**

This offers Roulette, Keno and Slots. Roulette is by far the star here. I wouldn't have paid for Keno and Slots, but they have come along for the ride.

### **Blackjack**

Three variations allow participation by the rich or poor, the extravagant or stingy. One or two people can play against the house. I liked this this cartridge, and I'm not a Blackjack buff. The shuffling sound is a cute touch. All APF game cartridges include audio effects.

### **Boxing**

Six variations pit player against player or player against computer. In games played against the computer, it is very tough to win. But there is a knockout strategy. Graphics are acceptable, although blocky-looking.

### **Brickdown/Shooting Match**

Connoisseurs of good brickdown (essentially a racketball game where the wall falls apart) will probably be disappointed. The game console joysticks control the paddle movement on the screen, as usual. But a small hesita-

tion between joystick input and paddle response makes for a frustrating experience. On the other hand, Shooting Match, like the other APF target games, offers fast, responsive fun.

### **UFO I/UFO II/Sea Monster/Break it Down/Rebuild/Shoot a Little/Shoot/Shoot a Lot**

All target games and all well done. Break it Down and Rebuild were especially fun. In Break it Down, the player drops "bombs" on what first looks like a solid square donut. When a bomb hits, it takes a small chunk out, leaving a hole that circulates quickly around the donut. When enough of these holes appear, it gets harder to hit the rapidly moving pieces left. The object is to use the fewest bombs to eliminate all pieces from the screen. Rebuild is just the reverse; one builds a donut. Cute.

### **Pinball/Dungeon Hunt/Blockout**

The nice thing about computer Pinball is that one is already used to synthesized sound effects in the electronic jobs found lining bar walls. Therefore the computer sounds so authentic. This is fast, challenging and responsive. One- and two-paddle versions are offered. The players must block both the bottom of the screen and the two sides to keep the ball from escaping. Dungeon Hunt, however, is misleading. It in no way relates to the rash of popular "dungeon" games involving dragons, sorcerers, hidden treasures, secret doors, missing floors and sudden death. This pale shadow more nearly resembles the old tv game Concentration. It's pick-a-square-and-see-what-turns-up. Blockout, on the other hand, is very interesting. The two players must create the longest trail on the screen without running into each other's trails, barriers within the field, or screen boundaries. I hope the fiend who dreamed up the version that continuously speeds up has trouble sleeping nights.



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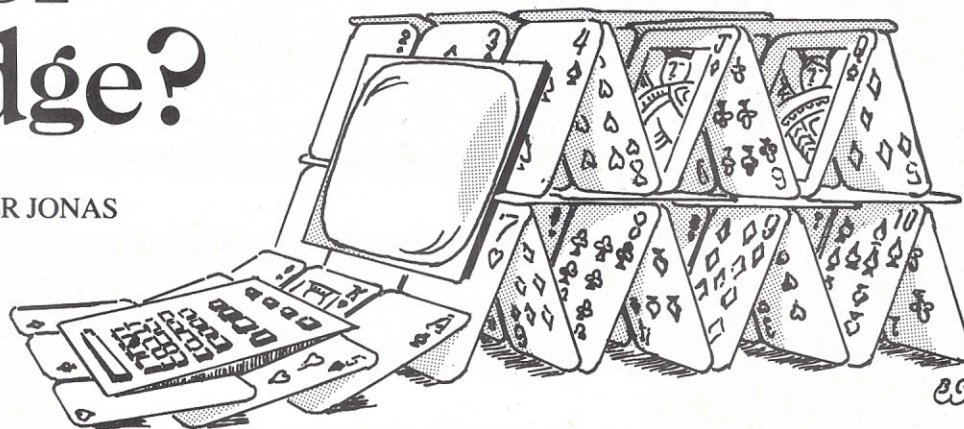
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# Anyone for Bridge?

BY PETER JONAS



For many years, the American Contract Bridge League has used computer-dealt hands at its major tournaments. You can duplicate these tournament conditions by using this program to deal out bridge hands.

The starting point for this bridge dealer is the random shuffle routine described by Andrew Russakoff in his article "Doing the 52 Card Shuffle" (*Personal Computing*, May 1978). After selecting a dealer and establishing vulnerability conditions, the computer deals out four hands from the previously shuffled deck thereby simulating actual table conditions. Finally, each hand is sorted into suits and printed. A by-product of the printing process is a useful 4 by 4 matrix which gives the distributions of the four hands and the four suits. The output requires 22 lines when the optional distribution matrix is included and 16 lines otherwise.

The program, written in North Star BASIC, should prove adaptable to most other BASICs. Let's go through it section by section.

## Bookkeeping

This simple section dimensions three matrices and defines three string variables. The A() matrix is used for the random shuffle. The B() matrix receives the subsequent deal. D( , ), the distribution matrix, ultimately shows how the four suits are distributed among the four hands. The string variables SS\$, V\$ and P\$ represent suit, value and position, respectively. They offer convenient access to single-letter

designations of the four suits (S,H,D,C), the five honor cards (A,K,Q,J,T), and the four positions at the table (N,S,E,W). Note that the letter "T" is used rather than "10" to avoid the complication of using two digits.

## Shuffle

This section comes almost verbatim from the article by Andrew Russakoff. The value of A(N) can range from 1 to 52. Values from 1 to 13 represent clubs; those from 14 to 26 represent diamonds; those from 27 to 39 are hearts; and those from 40 to 52 are spades. Within each suit, the lower values are spot cards and the higher values are honor cards. Since the ace is the "boss" card in bridge, I placed it at the top of the list rather than at the bottom; this slight deviation from Mr. Russakoff's scheme is merely one of interpretation. Throughout the program, these conventions are used:

$$S = \text{INT}((A(N) - 1) / 13)$$

If S=0, the suit is *Clubs*.

If S=1, the suit is *Diamonds*.

If S=2, the suit is *Hearts*.

If S=3, the suit is *Spades*.

As V varies from 1 to 13, the value of the card increases from the deuce to the ace.

$$V = A(N) - 13 * S$$

North Star BASIC uses a negative argument for RND to establish a random seed for the pseudo-random number generator. Your own BASIC may have its own preference here. Statements 160, 165 and 170 use the standard three-step procedure to exchange values between two variables: 1) the first value is stored in a dummy variable H; 2) the second value is assigned to the first variable; 3) the value in the dummy variable is assigned to the second variable.

## Select Dealer and Vulnerability Conditions

There are four possible dealers, namely West, North, East and South, as you go around the table. The variable X can take on integral values from 1 to 4. Each value of X designates a different position for the dealer.

In similar fashion, variable Y selects one of four vulnerability conditions. The sequence None, N-S, E-W, and Both follows the pattern of boards 1 through 4 in tournament bridge. (Both X and Y acquire their values via the function RND.)

In North Star BASIC, a statement such as

220 ON X GOTO 230,235,240,245  
is the equivalent of four IF-THEN statements:

```
220 IF X=1 THEN 230
221 IF X=2 THEN 235
222 IF X=3 THEN 240
223 IF X=4 THEN 245
```

Multiple statements can appear on a single line if the backslash is used.



Thus,

```
230 PRINT "WEST",\GOTO 250
is the equivalent of
230 PRINT "WEST",
231 GOTO 250
```

## Deal

The 52 cards which were previously stored in the A() matrix are now dealt into the B() matrix in a manner which simulates an actual deal at the table. Every fourth card from A() goes to a particular 13-card subset of B(). For printing purposes, it's useful to let B(1) through B(13) represent the West hand. Each successive group of 13 cards represents the next hand around the table. X is still the position of the dealer, as determined in section 3. I=1 represents the player to the immediate left of the dealer, namely the player who receives the first card.

As an example of how this section works, suppose that North is the dealer (X=2). Statements 320 and 335 combine to assign cards A(1), A(5), A(9), A(13), ..., A(49) to B(27), B(28), B(29), B(30), ..., B(39). When the argument of B( ) ultimately exceeds 52, the program subtracts 52 and begins assigning values to B(1), B(2), and so forth.

Unless you are a purist, section 4 can be omitted entirely. You would then take the first 13 cards in A( ) as the West hand, rather than taking every fourth card. Your choice depends to some extent on how much you want to simulate actual playing conditions.

You can add statements 303 REM \*\*\*\*\* and 304 REM \*\*\*\*\* for completeness if it suits your fancy. Copying a listing from a video monitor is a real chore!

## Sort

Each hand now contains 13 unsorted cards, as if they had just been picked up from the table. Section 5 arranges them in order of descending values, thus sorting them into suits at the same time. Each value of I sorts a different hand. A flow-chart is given in Figure 1.

Whenever any two cards such as B(1) and B(5) reach statement 430, they stay in the same position if B(1) is larger than B(5), but they trade positions otherwise. Statements 435, 440 and 445 use the same three-step exchange routine described earlier. In this manner, the first pass through the hand (I=0, J=1, K=2 TO 13) moves West's highest ranking card into the position B(1). The second pass (I=0,

J=2, K=3 to 13) moves West's second highest card into the position B(2). After twelve passes (J=1 TO 12), West's 13 cards are arranged in decreasing order. I is then incremented to 1 and the entire procedure is repeated for the North hand.

## Print

This section merely calls upon subroutines to do the actual printing.

## N-S Print Subroutines

S and V are the previously described suit and value variables, properly modified to take advantage of the current indices. If V evaluates to 1 through 8, V+1 gives the rank of the corresponding spot cards 2 through 9. (Statements 1745 & 1760.) If V evaluates to 9 through 13, a letter must be used to indicate the rank of the card. (Statement 1750.)

If a club void is encountered, the subroutine will process RETURN before I is decremented to zero. The little

routine from statement 1780 to 1795 was designed to correct this situation and print the appropriate headers. It was originally intended to be used with the E-W subroutine as well, but for present purposes it could just as well be appended to the preceding routine. If you want to do this, change statement 1775 to a REM and delete statements 1620 and 1680.

North Star BASIC uses the notation S\$(4,4) to designate the fourth character of the string variable S\$. If your BASIC uses some other scheme of specifying such subsets, you will have to modify statements 1725, 1750 and 1785 in this section, as well as statements 1815, 1860, 1910, 1960 and 570 in other sections.

## E-W Print Subroutine

The printing of the East and West hands proved to be somewhat tricky. You have to print the spade holding in both the West as well as the East hands before moving on to the next suit, hearts. JO and KO are used to mark the current positions in the two hands while we jump back and forth. The actual printing depends on the value of V, just as in section 18.

A secondary problem occurs if either hand runs into a club void, in effect running out of cards before the other. That's why J runs to 14 rather than 13 and K runs to 40 rather than 39. The last few steps check to make sure that I has decremented to 0, protecting against the quite unlikely situation where both West and East have club voids.

You would be finished now, except that I insisted on adding an artistic touch by printing the four compass positions in a little diamond in the middle of the display, just as they do in the newspapers and books. This feature involves making a decision about the value of T, which is the argument of the TAB command used in statements 1890 through 1905. Using T=26 gives a central diamond and a pleasing overall effect. However, if West ever picked up 10 or 11 hearts, he would be confused enough without trying to figure out what "W" and "E" were doing mixed in. In order to allow for a variable T, I included sections 6 and 7. Those who don't want the four compass positions can delete statements 1890 through 1905 and omit sections 6 and 7.

## Count Distribution

D( , ) is a 4 by 4 matrix which gives information about the distribution of

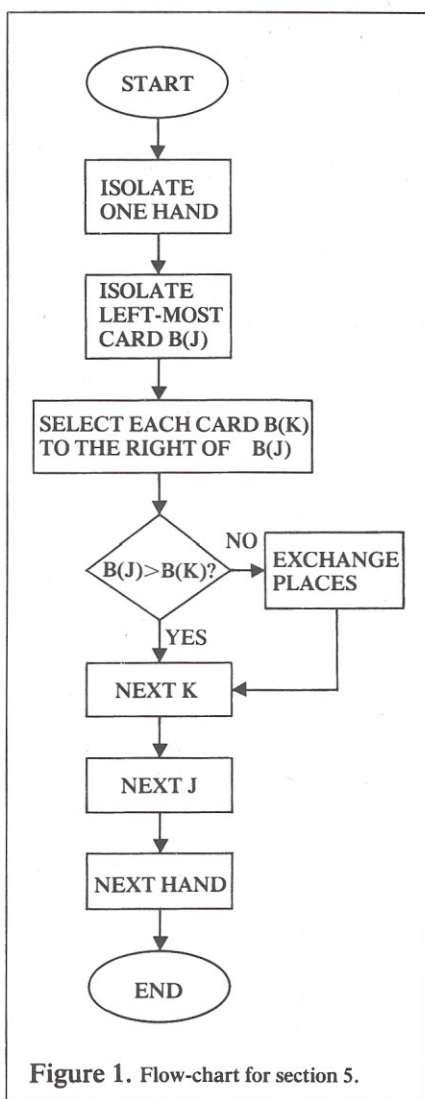


Figure 1. Flow-chart for section 5.



the suits. Rows 1 through 4 give the holdings around the table, starting with West. Columns 1 through 4 give the suits, starting with spades. A line which shows 4-2-1-6 distribution means 4 spades, 2 hearts, 1 diamond and 6 clubs, which is consistent with common bridge terminology.

S is the standard suit variable, properly disguised. As the suit of each card is identified in statement 520, the appropriate element in the D( , ) matrix is incremented in statement 525. To deal with the specific problem of the TAB variable T, you would only have to obtain the distribution of the West hand (I=1).

Statements 555 through 595 merely print the distribution matrix. If you decide that you don't want this output, either eliminate these statements or add something like 550 GOTO 600.

A word is in order about the distribution matrix. The information which it contains is not trivial. A huge part of the skill involved in the play of the hand as well as in defense involves being able to infer the missing elements of this matrix while looking at only two of the hands. Notice that all rows and all columns add up to 13.

### Set Tab

You'll want to use T=26 unless West shows up with a monstrous suit of ten or more cards. If this were algebra, you'd need two variables for this section. Computers let us use one variable T to do two tasks.

The first task for T is to indicate the length of West's longest suit. Initially T=0. It is then checked against D(1,1), D(1,2), D(1,3) and D(1,4), and is set equal to the largest of these. T will normally be less than ten, meaning that West has no suit longer than nine cards. Statement 680 then assigns T its standard value of 26 for its second task as the argument of TAB commands.

If West does turn up with a wild distribution, statement 645 starts with T = 26 and adds two units of printing space for each card in excess of nine in the long suit.

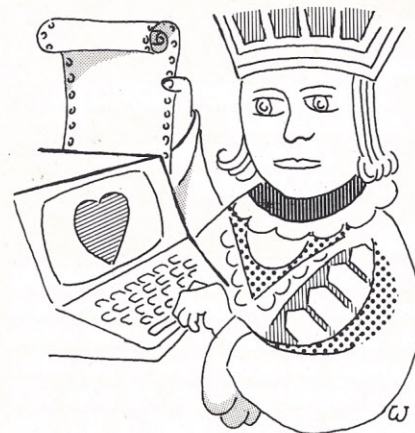
### For the Future

Section 6 just hints at what can be done with this program in terms of modification and sophistication. For example, suppose you want to count high-card points as well as distribution. The standard 4-3-2-1 system counts 4 points for each ace (V=13), 3 points for each king (V=12), and so on. You

can thus use V-9 to tabulate these points, as long as you take the precaution of siphoning off values of V less than ten. You can add these statements to the bottom of your BASIC listing to incorporate this new feature:

```
526 LET V=B(K+13*(I-1))-13*S
527 IF V<10 THEN 530
528 P(I)=P(I)+V-9
559 PRINT TAB(43), "POINTS",
569 PRINT TAB(44), P(I),
```

This rudimentary scheme does not make any allowances for singleton honors and so forth. □



## Sample Run

### Sample Run 1

DEALER: NORTH VULNERABILITY: NONE

|    | S: | H: | D: | C: |
|----|----|----|----|----|
| W: | 2  | 6  | 3  | 2  |
| N: | 4  | 2  | 3  | 4  |
| E: | 5  | 2  | 3  | 3  |
| S: | 2  | 3  | 4  | 4  |

S: K Q J 7  
H: T 2  
D: Q 9 6  
C: 9 6 4 2

S: T 3  
H: A K 9 8 7 5  
D: T 4 2  
C: K T

N  
W E  
S

S: A 9 6 5 4  
H: Q 6  
D: A 8 5  
C: Q J 3

S: 8 2  
H: J 4 3  
D: K J 7 3  
C: A 8 7 5

(Anyone noticing that the computer-dealt diamond holding in the WEST hand is "T 4 2" is entitled to a winsome smile.)

### Sample Run 2

DEALER: SOUTH VULNERABILITY: N-S

|    | S: | H: | D: | C: |
|----|----|----|----|----|
| W: | 2  | 4  | 2  | 5  |
| N: | 5  | 2  | 4  | 2  |
| E: | 2  | 5  | 3  | 3  |
| S: | 4  | 2  | 4  | 3  |

S: J T 6 4 2  
H: 5 2  
D: A 9 6 2  
C: A K

S: K 3  
H: T 7 4 3  
D: Q 4  
C: Q 9 8 6 2

N  
W E  
S

S: 9 7  
H: K Q J 9 8  
D: T 5 3  
C: T 7 3

S: A Q 8 5  
H: A 6  
D: K J 8 7  
C: J 5 4

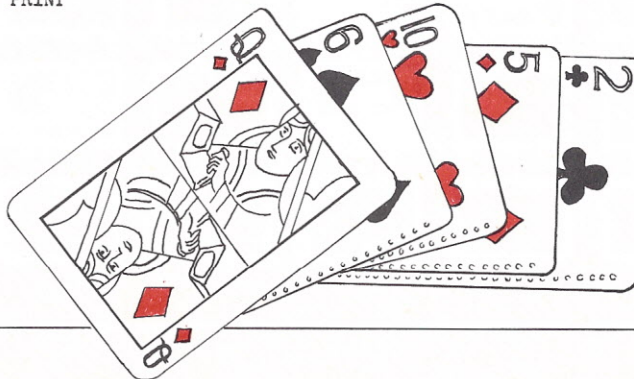


# Program Listing

```

10 REM *****
11 REM *****
12 REM ***** SECTION 1: BOOKKEEPING
13 REM *****
14 REM *****
20 DIM A(52),B(52)
30 DIM D(4,4)
40 S$="CDHS"
50 V$="TJQKA"
60 P$="WNES"
100 REM *****
101 REM *****
102 REM ***** SECTION 2: SHUFFLE
103 REM *****
104 REM *****
110 REM ***** REFERENCE PC, MAY '78,
    pg. 70, by ANDREW RUSSAKOFF
130 FOR N=1 TO 52
135   LET A(N)=N
140 NEXT N
150 FOR K=1 TO 52
155   LET R=INT(52*RND(-1)+1)
160   LET H=A(K)
165   LET A(K)=A(R)
170   LET A(R)=H
175 NEXT K
200 REM *****
201 REM *****
202 REM ***** SECTION 3: SELECT DEALER
    & VULNERABILITY CONDITIONS
203 REM *****
204 REM *****
210 PRINT TAB(10),"DEALER: ",
215 LET X=INT(4*RND(-1)+1)
220 ON X GOTO 230,235,240,245
230 PRINT "WEST ",\GOTO 250
235 PRINT "NORTH",\GOTO 250
240 PRINT "EAST ",\GOTO 250
245 PRINT "SOUTH",
250 PRINT TAB(30),"VULNERABILITY: ",
255 LET Y=INT(4*RND(-1)+1)
260 ON Y GOTO 270,275,280,285
270 PRINT "NONE"\GOTO 300
275 PRINT "N-S "\GOTO 300
280 PRINT "E-W "\GOTO 300
285 PRINT "BOTH"
300 REM *****
301 REM *****
302 REM ***** SECTION 4: DEAL
310 FOR I=1 TO 4
315   FOR J=1 TO 13
320     LET Z=J+13*(A+I-1)
325     IF Z<53 THEN 335
330     LET Z=Z-52
335     LET B(Z)=A(I+4*(J-1))
340   NEXT J
345 NEXT I
400 REM *****
401 REM *****
402 REM ***** SECTION 5: SORT
403 REM *****
404 REM *****
410 FOR I=0 TO 3
415   LET Z=13*I
420   FOR J=1 TO 12
425     FOR K=J+1 TO 13
430       IF B(J+Z)>B(K+Z) THEN 450
435       LET H=B(J+Z)
440       LET B(J+Z)=B(K+Z)
445       LET B(K+Z)=H
450     NEXT K
455   NEXT J
460 NEXT I
500 REM *****
501 REM *****
502 REM ***** SECTION 6: COUNT
    DISTRIBUTION
503 REM *****
504 REM *****
510 FOR I=1 TO 4
515   FOR K=1 TO 13
520     LET S=INT((B(K+13*(I-1))-1)/13)
525     LET D(I,4-S)=D(I,4-S)+1
530   NEXT K
535 NEXT I
555 PRINT
560 PRINT TAB(55),"S:",TAB(60),"H:",
    TAB(65),"D:",TAB(70),"C:"
565 FOR I=1 TO 4
570   PRINT TAB(51),P$(I,I),":",
575   FOR J=1 TO 4
580     PRINT TAB(49+5*J),D(I,J),
585   NEXT J
590   PRINT
595 NEXT I
600 REM *****
601 REM *****
602 REM ***** SECTION 7: SET TAB
603 REM *****
604 REM *****
610 LET T=0
620 FOR J=1 TO 4
625   IF D(1,J)<=T THEN 635
630   LET T=D(1,J)
635 NEXT J
640 IF T<10 THEN 680
645 LET T=26+2*(T-9)
650 GOTO 690
680 LET T=26
690 REM ***** ADDITIONAL PROGRAMMING
    CAN BE INSERTED HERE LATER.
1600 REM *****
1601 REM *****
1602 REM ***** SECTION 17: PRINT
1603 REM *****
1604 REM *****
1610 LET K=1
1615 GOSUB 1705
1620 GOSUB 1780
1625 PRINT
1650 GOSUB 1805
1670 LET K=3
1675 GOSUB 1705
1680 GOSUB 1780
1690 GOTO 1999
1700 REM *****
1701 REM *****
1702 REM ***** SECTION 18:
    N-S PRINT SUBROUTINES
1703 REM *****
1704 REM *****
1705 LET I=4
1710 FOR J=1 TO 13
1715   LET S=INT((B(J+13*K)-1)/13)
1720   IF S=I THEN 1740
1721   PRINT
1725   PRINT TAB(20),S$(I,I),": ",
1730   LET I=I-1
1735   GOTO 1720
1740   LET V=B(J+13*K)-13*S
1745   IF V<9 THEN 1760
1750   PRINT " ",V$(V-8,V-8),
1755   GOTO 1765
1760   PRINT V+1,
1765 NEXT J
1770 PRINT
1775 RETURN
1780 IF I=0 THEN 1795
1785 PRINT TAB(20),S$(I,I),": "
1790 LET I=I-1\GOTO 1780
1795 RETURN
1800 REM *****
1801 REM *****
1802 REM ***** SECTION 19:
    E-W PRINT SUBROUTINE
1803 REM *****
1804 REM *****
1805 LET I=4
1810 LET JO=1\LET KO=27
1815 PRINT S$(I,I),": ",
1820 FOR J=JO TO 14
1825   IF J<14 THEN 1835
1830   EXIT 1880
1835   LET S=INT((B(J)-1)/13)
1840   IF S=I-1 THEN 1850
1845   EXIT 1880
1850   LET V=B(J)-13*S
1855   IF V<9 THEN 1870
1860   PRINT " ",V$(V-8,V-8),
1865   GOTO 1875
1870   PRINT V+1,
1875 NEXT J
1880 LET JO=J
1890 ON I GOTO 1910,1905,1900,1895
1895 PRINT TAB(T+2),"N", \GOTO 1910
1900 PRINT TAB(T),"N E",\GOTO 1910
1905 PRINT TAB(T+2),"S",
1910 PRINT TAB(40),S$(I,I),": ",
1920 FOR K=KO TO 40
1925   IF K<40 THEN 1935
1930   EXIT 1980
1935   LET S=INT((B(K)-1)/13)
1940   IF S=I-1 THEN 1950
1945   EXIT 1980
1950   LET V=B(K)-13*S
1955   IF V<9 THEN 1970
1960   PRINT " ",V$(V-8,V-8),
1965   GOTO 1975
1970   PRINT V+1,
1975 NEXT K
1980 LET KO=K
1985 LET I=I-1
1986 PRINT
1990 IF I>0 THEN 1815
1995 RETURN
1999 END

```





# Improve Your Programming Effectiveness

BY CHARLES D. STERNBERG

Figure 1

| SYSTEM/PROGRAM                                                                                                                                                                                                                                                        | DESCRIPTION   | SYSTEM/PROGRAM               | PAGE | OF                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------|------|-----------------------|
|                                                                                                                                                                                                                                                                       |               | T-PRINT                      | 1    | 1                     |
| REMARKS DATA ENTRY FOR EACH SECTION CONTINUES UNTIL RECEIVING A NULL RESPONSE.<br>CHANGE PROCESS CAN BE REPEATED.<br>LINE PRINT SUBROUTINE IS USED TO PRINT DIVIDING LINES (HORIZ). THE LENGTH OF THE LINE VARIES BASED ON MAXIMUM LENGTH OF EXPLANATION/DESCRIPTION. |               |                              |      |                       |
|                                                                                                                                                                                                                                                                       |               | INITIALIZE                   |      |                       |
|                                                                                                                                                                                                                                                                       |               | ENTER SYMBOLS & DESC         |      |                       |
|                                                                                                                                                                                                                                                                       |               | ENTER FUNCTIONS & EXPL       |      |                       |
|                                                                                                                                                                                                                                                                       |               | PRINT RESULTS                |      |                       |
|                                                                                                                                                                                                                                                                       | ENTER CHANGES | Changes Y or N?              |      |                       |
|                                                                                                                                                                                                                                                                       |               | STOP (TERMINATION PROCEDURE) |      |                       |
|                                                                                                                                                                                                                                                                       |               |                              |      | LINE PRINT SUBROUTINE |

When "time is money," or when results are needed right away, the importance of good documentation can't be overestimated. With most home applications the time variable is not as important, but the irritations and frustrations caused by the lack of usable documentation are equally annoying.

Developing a computer program, regardless of its size, requires you to remember and recall a myriad of minute details. Each time that recall fails, you lose time reviewing the code, and errors through misinterpretation can occur. Even in personal programming the recall of program-specific facts tends to become bogged down and unreliable as programs and files increase in number and complexity.

Consider for a moment your answers to the following questions:

- Several programming efforts later, can you remember the function of variable A1 in an earlier program?
- After searching the directories (if they exist) of several disks or tapes, are you always able to immediately find the file or program that you were searching for?
- After finding three files named COINS, or a derivation thereof, do you

Charles Sternberg is author of BASIC Computer Programs for the Home, published by Hayden Book Company, Inc., 50 Essex St., Rochelle Park, NJ 07662. Price is \$8.95.

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normally try at least one of the old versions before finding the correct one?

- When you couldn't find the napkin that you had written a key part of your latest program on, did you decide to file all napkins?

If you have ever suffered from any of these frustrations, be prepared for increasing difficulties as you develop additional programs — unless you take action to correct the source of the problems.

A review of professional computer programming activities reveals that the problem also tends to exist there. It is overcome, however, with rigid documentation standards that are required (usually as a condition of continued employment). These documentation requirements, while not all necessary to personal applications, offer a solution to many of our difficulties. Comparing professional documentation with personal computing requirements shows several difficulties that can easily be remedied with a few simple forms.

I feel that the following documentation should be considered the minimum necessary for each program:

- All programs should have their general functional flow outlined before programming starts. This general flow diagram should be used in program design and kept for future use in program modification or review.

- All programs should have a symbol table describing all major program variables and their uses. This table should be developed as the program is written and then finalized and retained for future use.

- A coding form should be used to write the program. This form should satisfy the requirements of the language being used. The availability of forms that efficiently support Basic programming is extremely limited. To be most effective, the form must provide a means of noting the variables used, and above all, must provide a means to indicate GOTO points when the line number to be branched to occurs later in the program.

- A record of all existing files should be maintained. This record should include as a minimum for each file: its name, storage location and contents/description.

To illustrate the benefits of this formal documentation technique, I've taken a program and followed it through each phase of development with the documentation that was prepared at each stage. The actual program used in the example will also assist in your efforts — it produces a symbol

## Figure 2

| SYSTEM/PROGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                  | PROGRAMMER   | DATE       | PAGE   |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------|------------|--------|--------------|--|--------------|--|----|-----------------------|--|--|----|----------------------------------|--|--|-----|----------------|--|--|----|------------------|--|--|-----|--------------------|--|--|
| TPRINT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                  | STERNBERG    | July 9, 79 | 2 OF 2 |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
| REMARKS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                  |              |            |        |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
| <table border="1"> <thead> <tr> <th colspan="2">SYMBOL TABLE</th> <th colspan="2">SYMBOL TABLE</th> </tr> </thead> <tbody> <tr> <td>L1</td> <td>LENGTH OF EXPLANATION</td> <td></td> <td></td> </tr> <tr> <td>I2</td> <td>POINTER TO END OF FUNCTION ARRAY</td> <td></td> <td></td> </tr> <tr> <td>A\$</td> <td>INPUT VARIABLE</td> <td></td> <td></td> </tr> <tr> <td>C1</td> <td>CHANGE INDICATOR</td> <td></td> <td></td> </tr> <tr> <td>C\$</td> <td>ITEM TO BE CHANGED</td> <td></td> <td></td> </tr> </tbody> </table>                                                                                                                                                                                                                                 |                                  |              |            |        | SYMBOL TABLE |  | SYMBOL TABLE |  | L1 | LENGTH OF EXPLANATION |  |  | I2 | POINTER TO END OF FUNCTION ARRAY |  |  | A\$ | INPUT VARIABLE |  |  | C1 | CHANGE INDICATOR |  |  | C\$ | ITEM TO BE CHANGED |  |  |
| SYMBOL TABLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                  | SYMBOL TABLE |            |        |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
| L1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | LENGTH OF EXPLANATION            |              |            |        |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
| I2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | POINTER TO END OF FUNCTION ARRAY |              |            |        |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
| A\$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | INPUT VARIABLE                   |              |            |        |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
| C1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CHANGE INDICATOR                 |              |            |        |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
| C\$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ITEM TO BE CHANGED               |              |            |        |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |
| <pre> 10 IF A\$ = "N" THEN 20 C1 = C1 + 1 30 PRINT "ENTER ITEM TO CHANGE" 40 INPUT C\$ 50 IF C\$ &lt;&gt; "NAME" THEN 60 PRINT "ENTER NEW PROGRAM NAME" 70 INPUT P\$ 80 FOR J = 1 TO I1 90 IF C\$ &lt;&gt; I\$(J) THEN 100 PRINT "ENTER NEW ITEM, AND DESC" 110 INPUT I\$(J), D\$(J) 120 L = LEN(D\$(J)) 130 IF L &gt; M THEN M = L 140 GOTO 80 150 NEXT J 160 FOR J = 1 TO I2 170 IF C\$ &lt;&gt; F\$(J) THEN 180 PRINT "ENTER NEW FUNCTION, DESC" 190 INPUT F\$(J), E\$(J) 200 L1 = LEN(E\$(J)) 210 IF L1 &gt; M THEN M = L1 220 GOTO 160 230 NEXT J 240 IF C1 &gt; 0 THEN 250 REM * PROGRAM TERMINATES * 260 STOP 270 IF 280 REM * SUBROUTINE FOR LINES * 290 PRINT "I": 300 FOR J = 2 TO 4 + I4 310 PRINT " " 320 NEXT J 330 PRINT "I" 340 RETURN </pre> |                                  |              |            |        |              |  |              |  |    |                       |  |  |    |                                  |  |  |     |                |  |  |    |                  |  |  |     |                    |  |  |

## Sample Output

### MAJOR SYMBOL TABLE - TPRINT

| I | NAME   | .. DESCRIPTION                      | I |
|---|--------|-------------------------------------|---|
| I | M1     | .. MAXIMUM NUMBER OF SYMBOL NAMES   | I |
| I | M2     | .. MAXIMUM NUMBER OF FUNCTIONS      | I |
| I | I\$( ) | .. SYMBOL NAME ARRAY                | I |
| I | D\$( ) | .. SYMBOL DESCRIPTION ARRAY         | I |
| I | L      | .. LENGTH OF DESCRIPTION            | I |
| I | M      | .. LENGTH OF LONGEST ENTRY          | I |
| I | P\$    | .. PROGRAM NAME                     | I |
| I | I1     | .. POINTER TO END OF SYMBOL ARRAY   | I |
| I | F\$( ) | .. FUNCTION ARRAY                   | I |
| I | E\$( ) | .. FUNCTION EXPLANATION ARRAY       | I |
| I | L1     | .. LENGTH OF EXPLANATION            | I |
| I | I2     | .. POINTER TO END OF FUNCTION ARRAY | I |
| I | A\$    | .. INPUT VARIABLE                   | I |
| I | C1     | .. CHANGE INDICATOR                 | I |
| I | C\$    | .. ITEM TO BE CHANGED               | I |

### FUNCTIONS USED

| I | NAME  | .. DESCRIPTION                   | I |
|---|-------|----------------------------------|---|
| I | DIM   | .. DEFINES ARRAYS                | I |
| I | CLEAR | .. DEFINES LENGTH OF STRING AREA | I |
| I | LEN   | .. CALCULATES LENGTH OF A STRING | I |
| I | GOSUB | .. PERFORMS A TASK AND RETURNS   | I |
| I | TAB   | .. POSITION PRINT HEAD           | I |



description table on a printing terminal. Its use is shown later.

The initial step in the development is to produce a general flow diagram showing the relationships of the program's functions. This is accomplished using a flow diagram form. The use of the form to portray the outline and flow of the program is shown in Figure 1.

Having completed the flow diagram, I coded the program using a Basic Programming Form specific to the Basic language. Completion of the illustrated form occurs in two phases.

During the first phase the program is entered on the form without line numbers. The labels for GOTOs, GOSUBs and so forth are indicated as reference numbers in the circles on the right of the form. The lines to be branched to are indicated by entering the corresponding reference number on the left side of the form next to the statement that is the object of the GOTO. As variables are introduced to the program, they are recorded and described in the area at the top of the form.

The form, after completion of this step, is shown in Figure 2.

The next step is to enter the actual line numbers on the form. After all line numbers have been entered, the actual GOTO labels are easily determined by locating the line numbers associated with corresponding reference numbers written in the left and right margins. Figure 3 illustrates the final completed form.

The program is then entered via the terminal, run and tested. After it is complete and ready to be stored for future use, the location, file name and content/description are recorded on the File Record Form, as shown in Figure 4.

Next, obtain a program listing and create a symbol table for the program from the entries contained on the coding form. (Note that the program created in this example will prepare a symbol table for you. See the Sample Output.) A sample run of the program, along with its output, should be retained for documentation.

Using this approach to program development will speed both the original program's completion and later modification.

Also, you'll get a comprehensive series of documents including a general flow diagram, a program listing, a major symbol table and file identification/location information. These documents are well worth the time needed to prepare them. A file folder or binder completes the process. □

## Figure 3

| SYSTEM/PROGRAM |                                          | PROGRAMMER | DATE         | PAGE | OF |
|----------------|------------------------------------------|------------|--------------|------|----|
| T PRINT        |                                          | STERNBERG  | JULY 9, 79   | 2    | 2  |
| REMARKS        |                                          |            |              |      |    |
| SYMBOL TABLE   |                                          |            | SYMBOL TABLE |      |    |
| L1             | LENGTH OF EXPLANATION                    |            |              |      |    |
| I2             | POINTER TO END OF FUNCTION ARRAY         |            |              |      |    |
| A\$            | INPUT VARIABLE                           |            |              |      |    |
| C1             | CHANGE INDICATOR                         |            |              |      |    |
| C\$            | ITEM TO BE CHANGED                       |            |              |      |    |
| 560            | IF A\$ = "N" THEN 790                    |            |              |      | 13 |
| 570            | I1 = I1 + 1                              |            |              |      |    |
| 580            | PRINT "ENTER ITEM TO CHANGE"             |            |              |      |    |
| 590            | INPUT C\$                                |            |              |      |    |
| 600            | IF C\$ < "NAME" THEN 630                 |            |              |      | 14 |
| 610            | PRINT "ENTER NEW PROGRAM NAME"           |            |              |      |    |
| 620            | INPUT P\$                                |            |              |      |    |
| 630            | FOR J = 1 TO I1                          |            |              |      |    |
| 640            | IF C\$ < I\$(J) THEN 700                 |            |              |      | 15 |
| 650            | PRINT "ENTER NEW ITEM AND DESC"          |            |              |      |    |
| 660            | INPUT I\$(J), D\$(J)                     |            |              |      |    |
| 670            | L = LEN(D\$(J))                          |            |              |      |    |
| 680            | IF L > M THEN M = L                      |            |              |      |    |
| 690            | GOTO 540                                 |            |              |      | 16 |
| 700            | NEXT J                                   |            |              |      |    |
| 710            | FOR J = 1 TO I2                          |            |              |      |    |
| 720            | IF C\$ < F\$(J) THEN 780                 |            |              |      | 17 |
| 730            | PRINT "ENTER NEW FUNCTION, DESC"         |            |              |      |    |
| 740            | INPUT F\$(J), E\$(J)                     |            |              |      |    |
| 750            | L1 = LEN(E\$(J))                         |            |              |      |    |
| 760            | IF L1 > M THEN M = L1                    |            |              |      |    |
| 770            | GOTO 540                                 |            |              |      | 18 |
| 780            | NEXT J                                   |            |              |      |    |
| 790            | IF C1 > 0 THEN 280                       |            |              |      | 19 |
| 800            | REM * --- * PROGRAM TERMINATES * --- *   |            |              |      |    |
| 810            | STOP                                     |            |              |      |    |
|                |                                          |            |              |      |    |
|                |                                          |            |              |      |    |
| 820            | REM * --- * SUBROUTINE FOR LINES * --- * |            |              |      |    |
| 830            | PRINT "I":                               |            |              |      |    |
| 840            | FOR J = 1 TO M + 1                       |            |              |      |    |
| 850            | PRINT " - ";                             |            |              |      |    |
| 860            | NEXT J                                   |            |              |      |    |
| 870            | PRINT "I"                                |            |              |      |    |
| 880            | RETURN                                   |            |              |      |    |

## Figure 4

| FILES                                                                                                                                              |           |               | PAGE | OF |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------|------|----|
| NAME                                                                                                                                               | LOCATION  | TYPE          |      |    |
| T PRINT                                                                                                                                            | DISK #100 | BASIC PROGRAM |      |    |
| DESCRIPTION                                                                                                                                        |           |               |      |    |
| THIS PROGRAM PRODUCES A MAJOR SYMBOL AND FUNCTION USE TABLE FOR PROGRAM DOCUMENTATION. ALL DATA IS ENTERED VIA THE KEYBOARD - RESULTS ARE PRINTED. |           |               |      |    |
| NAME                                                                                                                                               | LOCATION  | TYPE          |      |    |
| DESCRIPTION                                                                                                                                        |           |               |      |    |
|                                                                                                                                                    |           |               |      |    |
| NAME                                                                                                                                               | LOCATION  | TYPE          |      |    |
| DESCRIPTION                                                                                                                                        |           |               |      |    |
|                                                                                                                                                    |           |               |      |    |
| NAME                                                                                                                                               | LOCATION  | TYPE          |      |    |
| DESCRIPTION                                                                                                                                        |           |               |      |    |
|                                                                                                                                                    |           |               |      |    |



## Program Listing

```

10 REM SYMBOL TABLE CREATION PROGRAM - SAVED AT TPRINT
20 REM ***** INITIALIZATION *****
30 CLEAR 5000
40 M1=50
50 M2=15
60 DIM I$(M1),D$(M1),F$(M2),E$(M2)
70 M=13
80 PRINT "ENTER THE PROGRAM NAME"
90 INPUT P$
100 PRINT "ENTER ITEM,DESCRIPTION - CR, WHEN FINISHED"
110 FOR I= 1 TO M1
120   I$(I)=" "
130   INPUT I$(I),D$(I)
140   IF I$(I)=" " THEN 180           'JUMP OUT OF LOOP
150   L=LEN(D$(I))
160   IF L>M THEN M=L
170 NEXT I
180 I1=I-1
190 PRINT "ENTER SPECIAL FUNCTIONS, DESCRIPTIONS"
200 FOR I= 1 TO M2
210   F$(I)=" "
220   INPUT F$(I),E$(I)
230   IF F$(I)=" " THEN 270           'JUMP OUT OF LOOP
240   L1=LEN(E$(I))
250   IF L1>M THEN M=L1
260 NEXT I
270 I2=I-1
280 REM ***** PRINT RESULTS *****
290 PRINT "POSITION PAPER NOW"
300 C1=0
310 INPUT A$
320 PRINT " MAJOR SYMBOL TABLE - ";P$
330 GOSUB 820
340 PRINT "I NAME .. DESCRIPTION"TAB(M+14)"I"
350 GOSUB 820
360 FOR J = 1 TO I1
370   PRINT "I";TAB(3);I$(J);TAB(9);".. "TAB(12)D$(J);TAB(M+14)"I"
380 NEXT J
390 GOSUB 820
400 IF I2=0 THEN 500           'GOES TO PROCESS CHANGES
410 PRINT
420 PRINT " FUNCTIONS USED"
430 GOSUB 820
440 PRINT "I NAME .. DESCRIPTION"TAB(M+14)"I"
450 GOSUB 820
460 FOR J= 1 TO I2
470   PRINT "I";TAB(3);F$(J);TAB(9);".. "TAB(12)E$(J);TAB(M+14)"I"
480 NEXT J
490 GOSUB 820
500 FOR J=1 TO 18
510   PRINT
520 NEXT J
530 REM ***** PROCESS CHANGES *****
540 PRINT "ARE THERE ANY CHANGES"
550 INPUT A$
560 IF A$="N" THEN 790           'GOES TO STOP
570 C1=C1+1
580 PRINT "ENTER ITEM TO CHANGE"
590 INPUT C$
600 IF C$<>"NAME" THEN 630           'GOES AROUND NAME CHANGE
610 PRINT "ENTER NEW PROGRAM NAME"
620 INPUT P$
630 FOR J = 1 TO I1
640   IF C$<> I$(J) THEN 700           'GOES TO CHECK NEXT ITEM
650   PRINT "ENTER NEW ITEM, AND DESC"
660   INPUT I$(J),D$(J)
670   L=LEN(D$(J))
680   IF L > M THEN M=L
690   GOTO 540           'GOES TO GET NEXT CHANGE
700 NEXT J
710 FOR J = 1 TO I2
720   IF C$<> F$(J) THEN 780           'GOES TO CHECK NEXT FUNCTION
730   PRINT "ENTER NEW FUNCTION,DESC"
740   INPUT F$(J),E$(J)
750   L1=LEN(E$(J))
760   IF L1 > M THEN M=L1
770   GOTO 540           'GOES TO GET NEXT CHANGE
780 NEXT J
790 IF C1>0 THEN 280           'GOES TO REPRINT TABLE
800 REM ***** PROGRAM TERMINATES *****
810 STOP
820 REM ***** SUBROUTINE FOR LINES *****
830 PRINT "I";
840 FOR J=2 TO M+14
850   PRINT "--";
860 NEXT J
870 PRINT "I"
880 RETURN

```

## WANTED:

## BUSINESS PROGRAMS

Our readers want your business applications programs. Chances are, the software you've developed to solve your business problems will also help someone else faced with a similar problem.

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 Boston, MA 02215



| SYSTEM/PROGRAM | DESCRIPTION | SYSTEM/PROGRAM | PAGE | OF |
|----------------|-------------|----------------|------|----|
| REMARKS        |             |                |      |    |

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| FILES       |          | PAGE | OF |
|-------------|----------|------|----|
| NAME        | LOCATION | TYPE |    |
| DESCRIPTION |          |      |    |
| NAME        | LOCATION | TYPE |    |
| DESCRIPTION |          |      |    |
| NAME        | LOCATION | TYPE |    |
| DESCRIPTION |          |      |    |
| NAME        | LOCATION | TYPE |    |
| DESCRIPTION |          |      |    |
| NAME        | LOCATION | TYPE |    |
| DESCRIPTION |          |      |    |
| NAME        | LOCATION | TYPE |    |
| DESCRIPTION |          |      |    |







# Real-Time Time Conversions

—BY JAMES H. NESTOR—

Most of us occasionally need to know what time it is in some faraway location such as London, Moscow or Honolulu. Perhaps we need to call someone and worry that our call will find them at work or wake them in the middle of the night. Knowing the time at some distant point may be important to an amateur radio operator scouting for DX or a travel agent computing jet lag.

The usual method of time conversion requires tables for the 24 world time zones and a map to find the zone in which a city is located. You must also determine if it is now 2:00 a.m. today, yesterday or tomorrow in, say, Tokyo. By the time you figure out what time it is, it isn't that time anymore!

This program for the TRS-80 performs all of those calculations for you. It can tell you the correct time and day in 106 different U.S. and foreign cities. Furthermore, it displays the time in "real-time"; that is, the display continuously updates itself to show the correct time in hours, minutes and seconds.

As you can see, this program makes use of the real-time clock in the TRS-80 expansion unit. Level II, 16K and one disk drive are required.

Before running the program, you must set the real-time clock in the command mode by entering the current 24-hour Eastern Standard Time, using the format TIME HH/MM/SS. The space after the word TIME is an essential part of the command. The most accurate method is to set the time one minute ahead and count down while listening to a time standard such as WWV or CHU. Press the ENTER key at the instant the time changes.

Once the time has been set, you may enter Basic, then load and run the program from the disk. The program must be run from disk rather than cassette. CMD "T", which is required when loading a cassette under Disk Basic, stops the real-time clock. When it is restarted by CMD "R", it resets to 00/00/00. For this reason, the program should be loaded from keyboard or cassette, then saved on the disk before attempting to run it. Once the program has been stored on disk I cannot imagine using any other mode since the disk is so convenient and fast a storage medium.

When the program is run, the screen displays a legend and a menu of selections. The legend explains that "+ signifies one day ahead of EST" and "- signifies one day behind

EST." For example, if the time is 12:00:00 Noon on *Monday* in New York (EST), the display for Auckland, New Zealand, will be 5:00:00+ to indicate that it is now 5 a.m. on *Tuesday* in Auckland.

Selections (1) and (2) on the menu provide a simultaneous display of the time in sixteen major cities in the United States (1) or sixteen major foreign cities (2). Both of these routines employ loops to update the times on the display.

Since it takes three seconds for each execution of the

loop, the times will be updated every three seconds. This should be accurate enough for most uses. You may show a more stable but less interesting display by changing the value of variable C\$ in line 2000 to read C\$=LEFT\$(D\$,3). This change eliminates seconds entirely from the display.

Since menu selections (1), (2) and (4) utilize loops, you must BREAK then RUN to return to the menu. Although the program will be halted, the real-time clock will continue to run. In fact, it will continue to run even if another program is loaded and run. It's only necessary to reset the clock if CMD "T" is used or the TRS-80 is turned off.

Selection (3) shows a list of 74 additional U.S. and foreign cities for which the time may be computed. The 32 cities in (1) and (2) are not shown to conserve memory and display space. If you have more than 16K of RAM, you can add more cities to the DATA statements beginning with line 10000. The DATA statements use the format: city name, state or country, difference in hours (+ or —) from EST. Cities must be added in pairs, and the value of L in line 5 must be increased by one for each city added to the list.

Selection (4) shows the time for any individual city from the list. Only the name of the city is entered. The display will then show the city, state or country, and the time in hours, minutes and seconds. Since this loop is shorter than (1) or (2), the display will be updated every second. If the display reads CITY NOT FOUND. CHECK THE LIST., you have probably made one of two errors: you've entered the name of a city not in the list, or you've misspelled the name. The search routine in lines 4000 to 4100 is "string literal" (IF P\$(X)=P\$ . . . .) and will not permit a misspelled name. If your keyboard bounces (don't they all?) and puts an extra L in London, the name will be rejected. Try again. □

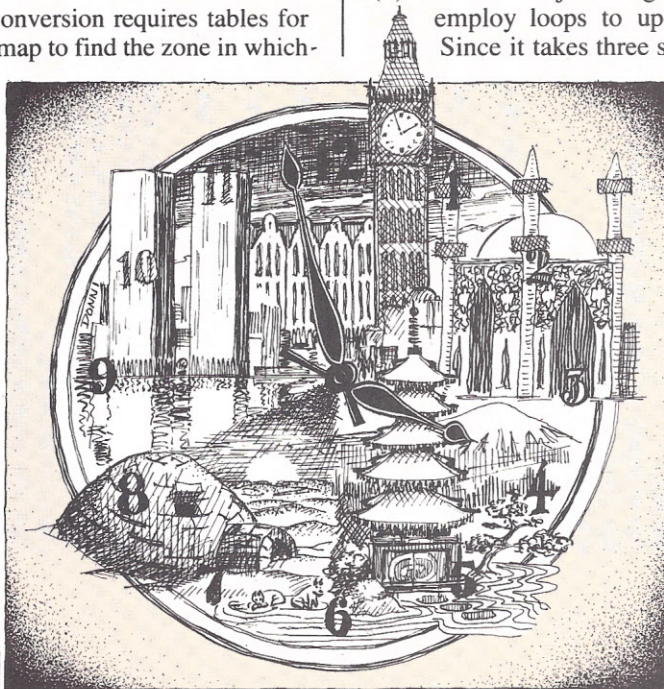


Illustration by Donni Richman



# Program Listing

```

2 CLEAR200
5 L=74
10 CLS
15 PRINTAB(21)*TRSDOS 2.1 REAL-TIME"
20 PRINT TAB(20) "TIME CONVERSION PROGRAM":PRINTAB(22)*"J. H. NESTOR 3/1/79":
  PRINTAB(19)*"-----"
25 PRINTAB(15)*" SIGNIFIES ONE DAY AHEAD OF EST"
27 PRINTAB(15)*" SIGNIFIES ONE DAY BEHIND EST"
28 PRINT:PRINTAB(22)*"SELECT DISPLAY OF:"
30 PRINT TAB(15)*(1.) MAJOR UNITED STATES CITIES"
40 PRINT TAB(15)*(2.) MAJOR CITIES OF THE WORLD"
50 PRINT TAB(15)*(3.) LIST OF ADDITIONAL CITIES"
70 PRINT TAB(15)*(4.) SELECT INDIVIDUAL CITIES ":PRINTAB(20)*"FROM LIST (3.)"
95 PRINT:PRINT TAB(20)*"ENTER YOUR SELECTION":INPUT S:ON S GOTO 990,98,4200,4000
98 CLS
100 D=5:GOSUB2000:PRINT@1,"ROME":PRINT@17,F;C$;Q$
150 D=6:GOSUB 2000:PRINT@33,"PARIS":PRINT@49,F;C$;Q$
300 D=1:GOSUB2000:PRINT@129,"CARACAS":PRINT@145,F;C$;Q$
350 D=2:GOSUB2000:PRINT@257,"RIO DE JANEIRO":PRINT@273,F;C$;Q$
400 D=5:GOSUB2000:PRINT@385,"LONDON":PRINT@401,F;C$;Q$
450 D=6:GOSUB2000:PRINT@513,"BERLIN":PRINT@529,F;C$;Q$
500 D=7:GOSUB2000:PRINT@641,"JERUSALEM":PRINT@657,F;C$;Q$
550 D=8:GOSUB2000:PRINT@769,"MOSCOW":PRINT@785,F;C$;Q$
600 D=10:GOSUB 2000:PRINT@897,"KARACHI":PRINT@913,F;C$;Q$
650 D=11:GOSUB2000:PRINT@161,"RANGOON":PRINT@177,F;C$;Q$
700 D=12:GOSUB2000:PRINT@289,"BANGKOK":PRINT@305,F;C$;Q$
750 D=13:GOSUB2000:PRINT@417,"HONG KONG":PRINT@433,F;C$;Q$
800 D=14:GOSUB2000:PRINT@545,"TOKYO":PRINT@561,F;C$;Q$
850 D=15:GOSUB2000:PRINT@673,"SYDNEY":PRINT@689,F;C$;Q$
900 D=17:GOSUB2000:PRINT@801,"AUCKLAND (NZ)":PRINT@817,F;C$;Q$
950 D=7:GOSUB 2000:PRINT@929,"CAPE TOWN":PRINT@945,F;C$;Q$
970 GOTO 100
990 CLS
1000 D=0:GOSUB2000
1010 PRINT@1,"NEW YORK":PRINT @17,F;C$;Q$
1050 D=0:GOSUB2000
1060 PRINT@ 33,"BOSTON":PRINT@49,F;C$;Q$
1100 D=0:GOSUB 2000
1110 PRINT@129,"WASHINGTON, D. C. ":PRINT@145,F;C$;Q$
1150 D=0:GOSUB 2000
1160 PRINT@ 161,"MIAMI":PRINT@177,F;C$;Q$
1200 D=0:GOSUB2000
1210 PRINT@257,"DETROIT":PRINT@273,F;C$;Q$
1250 D=1:GOSUB2000
1260 PRINT@289,"CHICAGO":PRINT@305,F;C$;Q$
1300 D=1:GOSUB2000
1310 PRINT@385,"HOUSTON":PRINT@401,F;C$;Q$
1350 D=1:GOSUB2000
1360 PRINT@417,"KANSAS CITY":PRINT@433,F;C$;Q$
1400 D=1:GOSUB2000
1410 PRINT@513,"ST. LOUIS":PRINT@529,F;C$;Q$
1450 D=1:GOSUB2000
1460 PRINT@545,"MINNEAPOLIS":PRINT@561,F;C$;Q$
1500 D=2:GOSUB2000
1510 PRINT@641,"DENVER":PRINT@657,F;C$;Q$
1550 D=2:GOSUB2000
1560 PRINT@673,"PHOENIX":PRINT@689,F;C$;Q$

```

```

1600 D=-2:GOSUB2000
1610 PRINT@769,"SALT LAKE CITY":PRINT@785,F;C$;Q$
1650 D=-3:GOSUB2000
1660 PRINT@801,"LOS ANGELES":PRINT@817,F;C$;Q$
1700 D=-3:GOSUB2000
1710 PRINT@897,"SEATTLE":PRINT@913,F;C$;Q$
1750 D=0:GOSUB2000
1760 PRINT@929,"CLEVELAND":PRINT@945,F;C$;Q$
1990 GOTO 1000
2000 A$=RIGHT$(TIME$,8):B$=LEFT$(A$,2):B=VAL(B$):D$=RIGHT$(A$,6):C$=LEFT$(D$,6):F=B+D
2020 IF F=24 F=0
2030 IF F>23 F=F-24
2040 IF F<0 AND D>=0 THEN Q$=" " ELSE Q$=""
2045 IF D<0 AND B<6 THEN Q$="- "
2047 IF D<0 AND B<6 THEN F=F+24+D
2050 RETURN
4000 DIM P$(L),Q$(3),R$(L),R(L):CLS
4005 PRINT
4010 PRINT"ENTER THE NAME OF THE CITY YOU WISH":INPUT P$
4020 FOR X= 1 TO L
4030 READ P$(X),R$(X),R(X)
4040 IF P$(X)=P$ THEN D=R(X):GOSUB 5000
4050 NEXT X
4060 CLS:PRINT:PRINT"CITY NOT FOUND. ":PRINT"CHECK THE LIST. ":RESTORE:GOTO 4005
4100 END
4200 DIM P$(L),R$(L),R(L):FOR X= 1 TO L:READ P$(X),R$(X),R(X):NEXT X
4220 RESTORE
4250 G=65
4300 CLS: FOR X=1 TO L STEP 2
4310 PRINT @ G,P$(X);", ";R$(X):PRINT @ G+35,P$(X+1);", ";R$(X+1)
4320 G=G+64
4330 IF G=897 THEN PRINT@ 913,"PRESS =ENTER= TO CONTINUE":INPUT U$:G=65:CLS
4350 NEXT X
4500 PRINT@913,"PRESS =ENTER=TO RETURN TO MENU":INPUT V$:RUN
5000 R(X)=D:GOSUB2000:PRINT@460, P$(X);", ";R$(X);" ";F;D$;Q$
5020 PRINT@833,"TO RETURN TO MENU- PRESS =BREAK= THEN =RUN= THEN =ENTER="
5030 GOTO 5000
10000 DATAKRON,OHIO,0,AMSTERDAM,HOLLAND,6,ATHENS,GREECE,7,ATLANTA,GEORGIA,0,AUSTIN,TEXAS,-1,BAGHDAD,IRAN,8,BALTIMORE,MARYLAND,0
10010 DATA BELFAST,IRELAND,5,BOGATA,COLUMBIA,0,BIRMINGHAM,ALABAMA,-1
10020 DATA BOISE,IDAHO,-2,BOSTON,MASSACHUSETTS,0,BUFFALO,NEW YORK,0,BUTTE,MONTANA,-2,BRUSSELS,BELGIUM,6
10030 DATA BUDAPEST,HUNGARY,7,BUENOS AIRES,ARGENTINA,2,CALGARY,(ALBERTA) CANADA,-2,CHARLESTOWN,SOUTH CAROLINA,0,CHARLOTTE,NORTH CARO
LINA,0,CHEYENNE,WYOMING,-2
10040 DATACOPENHAGEN,DENMARK,6,COLORADO SPRINGS,COLORADO,-2
10050 DATA DAWSON,(YUKON) ALASKA,-4,DJAKARTA,INDONESIA,12,DULUTH,MINNESOTA,-1,DUBLIN,IRELAND,5
10060 DATA EL PASO,TEXAS,-2,FAIRBANKS,ALASKA,-5,GENEVA,SWITZERLAND,6,HAVANA,CUBA,0,HELENA,MONTANA,-2
10070 DATA HONOLULU,HAWAII,-5,INDIANAPOLIS,INDIANA,0,ISTANBUL,TURKEY,7,JACKSONVILLE,FLORIDA,0,KNOXVILLE,TENNESSEE,0,LENINGRAD,RUSSIA
,8
10080 DATA LIMA,PERU,0
10090 DATA LISBON,PORTUGAL,6,LINCOLN,NEBRASKA,-1,LITTLE ROCK,ARKANSAS,-1,MADRID,SPAIN,6,MELBOURNE,AUSTRALIA,15,MEXICO CITY,MEXICO,-1
,MONTREAL,CANADA,0
10100 DATA MONTEVIDEO,CHILE,2,OSLO,NORWAY,6,PHILADELPHIA,PENNSYLVANIA,0,PEKING,CHINA,13,PRAGUE,CZECHOSLOVAKIA,6
10110 DATA PORTLAND,OREGON,-3,RENO,NEVADA,-3
10120 DATA TORONTO,(ONTARIO) CANADA,0
10130 DATA SAIGON,VIET NAM,13,SEOUL,KOREA,14,SAN FRANCISCO,CALIFORNIA,-3,SAVANNAH,GEORGIA,0,SAN DIEGO,CALIFORNIA,-3,STIOUX FALLS,SOUT
H DAKOTA,-1,SPOKANE,WASHINGTON,-3,STOCKHOLM,SWEDEN,6
10140 DATA TORONTO,(ONTARIO) CANADA,0,TULSA,OKLAHOMA,-1,VANCOUVER,BRITISH COLUMBIA,-3,VIENNA,AUSTRIA,6
10150 DATA VALPARAISO,CHILE,1,VLADIVOSTOK,RUSSIA,15,WARSAW,POLAND,6,WICHITA,KANSAS,-1,WILMINGTON,DELAWARE,0,WINNEPEG,(MANITOBA) CANA
DA,-1,YOKAHAMA,JAPAN,14,ZURICH,SWITZERLAND,6

```



# Sample Run

TRSDOS 2.1 REAL-TIME  
TIME CONVERSION PROGRAM  
J. H. NESTOR 3/1/79

+ SIGNIFIES ONE DAY AHEAD OF EST  
- SIGNIFIES ONE DAY BEHIND EST

SELECT DISPLAY OF:  
(1.) MAJOR UNITED STATES CITIES  
(2.) MAJOR CITIES OF THE WORLD  
(3.) LIST OF ADDITIONAL CITIES  
(4.) SELECT INDIVIDUAL CITIES  
FROM LIST (3.)

ENTER YOUR SELECTION? 1\_

|                   |          |             |          |
|-------------------|----------|-------------|----------|
| NEW YORK          | 8 :12:17 | BOSTON      | 8 :12:17 |
| WASHINGTON, D. C. | 8 :12:17 | MIAMI       | 8 :12:17 |
| DETROIT           | 8 :12:17 | CHICAGO     | 7 :12:17 |
| HOUSTON           | 7 :12:17 | KANSAS CITY | 7 :12:17 |
| ST. LOUIS         | 7 :12:17 | MINNEAPOLIS | 7 :12:17 |
| DENVER            | 6 :12:17 | PHOENIX     | 6 :12:17 |
| SALT LAKE CITY    | 6 :12:17 | LOS ANGELES | 5 :12:17 |
| SEATTLE           | 5 :12:17 | CLEVELAND   | 8 :12:17 |

ENTER YOUR SELECTION? 2\_

|                |           |               |            |
|----------------|-----------|---------------|------------|
| ROME           | 13 :12:17 | PARIS         | 14 :12:17  |
| CARACAS        | 9 :12:17  | RANGOON       | 19 :12:17  |
| RIO DE JANEIRO | 10 :12:17 | BANGKOK       | 20 :12:17  |
| LONDON         | 13 :12:17 | HONG KONG     | 21 :12:17  |
| BERLIN         | 14 :12:17 | TOKYO         | 22 :12:17  |
| JERUSALEM      | 15 :12:17 | SYDNEY        | 23 :12:17  |
| MOSCOW         | 16 :12:17 | AUCKLAND (NZ) | 1 :12:17 + |
| KARACHI        | 18 :12:17 | CAPE TOWN     | 15 :12:17  |

ENTER YOUR SELECTION? 3\_

|                             |                           |
|-----------------------------|---------------------------|
| AKRON, OHIO                 | AMSTERDAM, HOLLAND        |
| ATHENS, GREECE              | ATLANTA, GEORGIA          |
| AUSTIN, TEXAS               | BAGHDAD, IRAN             |
| BALTIMORE, MARYLAND         | BELFAST, IRELAND          |
| BOGATA, COLUMBIA            | BIRMINGHAM, ALABAMA       |
| BOISE, IDAHO                | BOSTON, MASSACHUSETTS     |
| BUFFALO, NEW YORK           | BUTTE, MONTANA            |
| BRUSSELS, BELGIUM           | BUDAPEST, HUNGARY         |
| BUENOS AIRES, ARGENTINA     | CALGARY, (ALBERTA) CANADA |
| CHARLESTOWN, SOUTH CAROLINA | CHARLOTTE, NORTH CAROLINA |
| CHEYENNE, WYOMING           | COPENHAGEN, DENMARK       |
| COLORADO SPRINGS, COLORADO  | DAWSON, (YUKON) ALASKA    |
| DJAKARTA, INDONESIA         | DULUTH, MINNESOTA         |

PRESS =ENTER= TO CONTINUE? \_

|                            |                       |
|----------------------------|-----------------------|
| DUBLIN, IRELAND            | EL PASO, TEXAS        |
| FAIRBANKS, ALASKA          | GENEVA, SWITZERLAND   |
| HAVANA, CUBA               | HELENA, MONTANA       |
| HONOLULU, HAWAII           | INDIANAPOLIS, INDIANA |
| ISTANBUL, TURKEY           | JACKSONVILLE, FLORIDA |
| KNOXVILLE, TENNESSEE       | LENINGRAD, RUSSIA     |
| LIMA, PERU                 | LISBON, PORTUGAL      |
| LINCOLN, NEBRASKA          | LITTLE ROCK, ARKANSAS |
| MADRID, SPAIN              | MELBOURNE, AUSTRALIA  |
| MEXICO CITY, MEXICO        | MONTREAL, CANADA      |
| MONTEVIDEO, CHILE          | OSLO, NORWAY          |
| PHILADELPHIA, PENNSYLVANIA | PEKING, CHINA         |
| PRAGUE, CZECHOSLOVAKIA     | PORTLAND, OREGON      |

PRESS =ENTER= TO CONTINUE? \_

|                             |                             |
|-----------------------------|-----------------------------|
| RENO, NEVADA                | TORONTO, (ONTARIO) CANADA   |
| SAIGON, VIET NAM            | SEOUL, KOREA                |
| SAN FRANCISCO, CALIFORNIA   | SAVANNAH, GEORGIA           |
| SAN DIEGO, CALIFORNIA       | SIOUX FALLS, SOUTH DAKOTA   |
| SPOKANE, WASHINGTON         | STOCKHOLM, SWEDEN           |
| TORONTO, (ONTARIO) CANADA   | TULSA, OKLAHOMA             |
| VANCOUVER, BRITISH COLUMBIA | VIENNA, AUSTRIA             |
| VALPARAISO, CHILE           | VLADIVOSTOK, RUSSIA         |
| WARSAW, POLAND              | WICHITA, KANSAS             |
| WILMINGTON, DELAWARE        | WINNEPEG, (MANITOBA) CANADA |
| YOKAHAMA, JAPAN             | ZURICH, SWITZERLAND         |

PRESS =ENTER=TO RETURN TO MENU? \_

ENTER YOUR SELECTION? 4\_

ENTER THE NAME OF THE CITY YOU WISH? TORONTO

TORONTO, (ONTARIO) CANADA 8 :12:17

TO RETURN TO MENU- PRESS =BREAK= THEN =RUN= THEN =ENTER=



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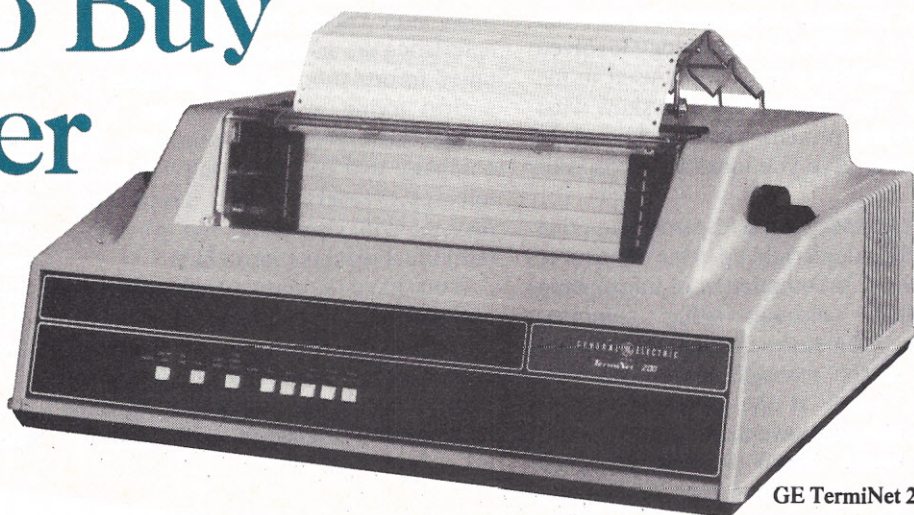


MICRO PERIPHERALS, INC. 2099 WEST 2200 SOUTH / SALT LAKE CITY, UTAH 84119 / (801) 973-6053



# How to Buy a Printer

BY KEN MAZUR



GE TerminiNet 200

There are two ways to purchase a printer for your microcomputer system: buy and pray, or plan and buy. The first method is usually quicker but often leads to frustration and unhappiness as you discover your new peripheral's limitations.

The second method, plan and buy, involves a tremendous amount of work initially but results in greater satisfaction when you adequately anticipate potential uses for your new peripheral.

The planning process suggested here involves four phases: 1) determination of needs; 2) research; 3) comparison; and 4) the final selection.

Before beginning, however, you must realize that although each phase is discussed as a distinct operation, it isn't. The selection process is iterative. At any point in time you will be working in a number of the steps. In programming terms, the selection process resembles numerous nested loops. And, like the loops of a Basic program, even when it doesn't seem like you're making much progress, each For/Next brings you closer to successful completion.

"Should I buy a printer?" is a question most microcomputer owners ask themselves at one point or another but the answer varies from moment to moment as the mental struggle of cost versus use goes first one way and then the other.

A more productive question to ask is, "Do I need a printer?" This question forces you to think about your system both in terms of what you *are* doing with it; and, at a later stage, what you

*plan* to do with it. There are some broad categories which can help you decide whether the answer is "yes."

For almost all business uses, a printer is essential. If you do word processing on your micro (letters, manuscripts, etc., as opposed to business word processing), you need a printer. If you write programs that are relatively

---

## First ask yourself, "Do I need a printer?"

---

long (each person to determine his/her own level of tolerance when trying to debug a program with about 20 lines to look at on the video display) or fairly sophisticated in terms of logic structure or programming style, a printer ranges from extremely valuable to essential. If you require printed output of records (household, financial, tax, birthday lists, etc.), you need a printer.

To best determine specific needs for a substantially priced peripheral, you might want to make two columns on a pad of a paper. In the left column list all the things you would do with the printer as soon as it was hooked up. In the right hand column, list all the functions you would ultimately like to perform with your system.

Next, translate the question "Should

I buy a printer?" to "Do I want to part with the necessary dollars to perform the functions I've listed?"

Try to assign a dollar value to those items you've listed on that pad. It will be tough and values will vary from individual to individual, but the technique may prove useful. For instance, a hobbyist may determine that keeping track of expenses and having his/her machine print them out at tax time is worth "x" dollars in terms of time saved. Most likely, this value will be considerably smaller than for the businessman who finds that having a micro keep a mailing list of clients is worth "xx" dollars in time saved by not having the company secretary perform that function. One way to look at the problem is to try to determine how much you would be willing to pay to have the function performed by a non-computerized method.

Results of this step will vary from nebulous to very specific but the mere process of trying to determine what a printer will be worth to you will force you to think about that printer in concrete terms. Forcing yourself to think about what the printer will do for you and how much it is worth to you will result in a better decision when it's time to invest your dollars.

If the value of those printer functions is between \$200 and \$500 (arbitrary figures, really, but ones which you should be able to receive in value over a short, two-year period), you might want to take the next step in your investigation.

Once you have a concrete idea of



what you would do with a printer, institute a research phase. Begin by reading articles. Generalized articles in magazines (see the April issue of *Personal Computing*) or introductory books about personal computers will give you a good feel for the technology involved and familiarity with terms used in the field. The articles may also show what functions printers perform for others and may give you ideas to list on your pad.

One aspect of the research phase that should extend right up to the moment of purchase is compilation of information available through other computer buffs. Visit stores that sell printers and talk to the manager and/or salespersons. Look at the different printers available and have them operated while you watch. See if the store personnel will give you the names of previous customers who own the types of machines you're looking at. Find a computer club (see the list in the March issue of *Personal Computing*). Not only do user's groups expose you to a variety of hardware, but enable you to meet a group of new friends who share your enthusiasm for computing. There is no substitute for direct exposure to equipment and talking to a person who has used the machine for some time.

Use your original "things I'll do with a printer" list frequently. By looking at what you're going to do with your micro and what you realistically would like to do with it, you should be able to come up with some generalized, minimum characteristics/functions/options that any printer for your system should have. Think about the maximum number and range of options for your ideal situation as well. All machines having at least the minimal features are the ones you should consider. Decide on your ranges and go to a comparison chart (such as the one in this issue) to quickly scan printer characteristics.

Use the chart to save time and avoid the false starts of investigating machines that either exceed your budget or don't have the necessary qualities. Cull the printers that obviously do not fall within your area of interest. What you should have after weeding is a reduced list of prospective possibilities. These are the printers you should be interested in. At this point, your list of possibilities covers a number of printers from those with the least acceptable standards for you to the "wouldn't it be nice if I could afford a . . ." variety.

The next step of the research phase is to send for literature concerning the printers you wish to compare more

closely. The printer market is booming and everyone is beginning to put them out. New companies and old companies are working feverishly to attract the finite dollar market in personal computer land. Charts listing general characteristics are no substitute for the detailed information packets provided by a firm trying to sell its wares. If a printer has noteworthy qualities, the company will be sure to tell you in its releases. Generally, the information packets will also show you what the individual machine looks like.

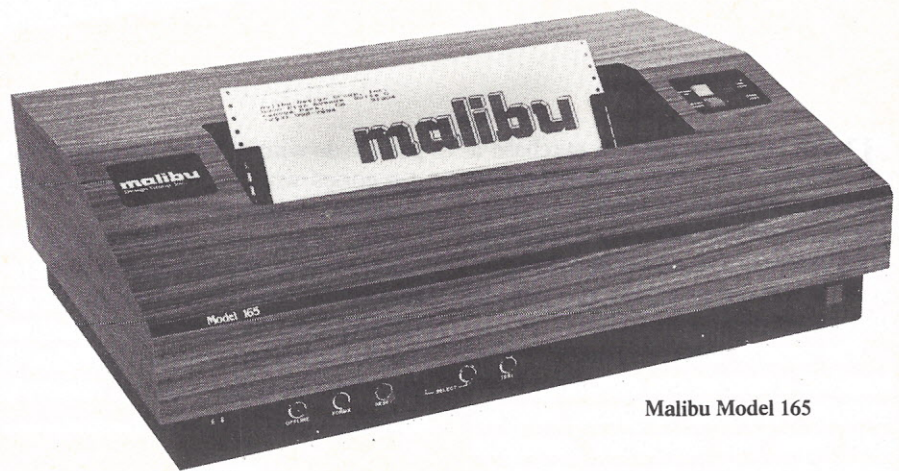
You have a mass of promotional material to judge but first you have to determine those aspects of the machines that are important to you. Specifically, decide the importance of unit expense, printing speed, quality of out-

printer is going to cost by the time you get it hooked up and working.

Speed is a highly touted feature in the printer world. With increased speed generally comes a higher price tag, so be realistic in judging the value of speed to your application. For a business, speed is more important than for the hobbyist using a printer for program development.

Tied to speed and price is quality of output. As you increase the requirements for fast output and character quality, you will notice a corresponding increase in price for the most part. And, as usual, your applications will in large part determine what you can get.

The IBM typewriter converted to serve as a printer is a prime example of the tradeoffs involved in trying to pick a



Malibu Model 165

put, typeface, noise level, service availability, reliability and maintainability.

As the relative importance of these aspects varies from individual to individual, the two-column list you've drawn up will force you to consider factors that involve the microcomputer-printer system's environment.

All the aspects should be juggled until they are in some order of priority if possible. As you define the priorities, you'll find you have even more ammunition to weed out the "don't wants."

Be aware of what you have to consider. For instance, the price you ultimately pay to have something come off your micro in hard copy is the *real* price of a printer. The basic price you read may or may not be all there is to it. Check with the manufacturer and others if you're not sure. Read the specifications closely to see if you also have to purchase a special interface to get that printer working with your system. Check to see if it requires special cables. Are the cables included in the package? Who pays shipping? Know to the last penny what that particular

printer. If your application requires limited quantities of letter quality output, an IBM is hard to beat. But (and there always seem to be "buts" in the selection process) it is relatively slow. If you have to print up some letters to friends, clients or whomever, the IBM may be ideal. If you have to crank out 300 letters (all of which you want to look individually typed), you'll find that the slow speed will begin to annoy you. Plus, your IBM may beat itself to death through constant running. There are few human secretaries who can type fast enough to force an IBM to its fullest extent but a micro will push it to its limits in short order.

To get a machine that will give you both high quality (on the order of the IBM) and speed, you better start looking at the upper end of the pricing scale.

Judge character quality in terms of what you need. Do you require letter quality originals? How about reports that are readable but not the quality of the higher priced spreads? Should you be able to make copies? How important is quality of the original and/or copies of that original?





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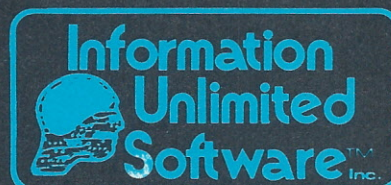
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Unlike speed, which can be measured in definite terms, type quality is subjective in nature. What is acceptable to one user in a specific application is unacceptable to another. Someone who needs hard copy on a temporary basis for personal use (a scientist in a lab or a hobbyist debugging a program) may find that an electrosensitive machine with specially treated paper is adequate; but you could hardly use that machine to distribute P and L statements to your board of directors. A nice dot matrix could be adequate to print out invoices, internal reports or mailing labels. If you produce materials that are going beyond the confines of the company and you don't want the result to look like it came off a computer, better start looking for that IBM, daisy wheel or stylus machine. There's just no getting away from constantly considering what the end use of that machine is going to be.

What type face do you want? If you do a great deal of variable word processing in a business atmosphere, you might be interested in machines with variable type styles, fonts, or software controllable letter styles.

Noise can be important, too. For a hobbyist, even the clanking of an old Teletype is music to the ears. But a crowded office or other noise-conscious environment forces consideration of sound impact to a greater extent. Does the machine make noise all the time or just when it's printing? How much noise does it make when it does print? (This can range from the "bzzzzzz" of some of the newer printers to the machinegun chatter of a converted IBM.) You may not get this information from a specification sheet so be sure to listen to a machine operate.

Here's where we hit one of those iterative loops. Go back over the spec sheets you received. This time, look for the qualities that you judge important to your application beyond those promoted by the firm in its release. Some may not say much about what you're concerned with so contact the vendor for more information or start checking around to locate someone who has the machine.

And then there are factors you should consider beyond the trumpeted qualities of the printers in the spec sheets. A printer doesn't begin to exist when it's attached to your personal computer. It was made by people and will be put under the stress of any machine being used — it ceases to be new. Even "new" has its dangers, however, in

that a breakdown will most often occur in the first few hours of operation. In other words, with machines as complicated as your micro and its printer, failures are inevitable, or at least common. What happens when the printer doesn't work?

The ultimate solution for having your system down is to have a backup system. While a backup system is within the range of some small businesses, it is frequently too expensive for the personal user to invest in another complete system or to even have specific peripheral backups. But even if you do have backups, take reliability, service availability and maintainability into account when purchasing a printer.

Many manufacturers provide Mean Time Between Failures (MTBF) figures on product spec sheets. The figures are only a guide, however, and won't ease the anguish if you happen to have one of those machines that gives out in the first few hours. For reliability references, the best thing you can do is read reviews on particular printers and ask around at a user's group to find if anyone has or knows someone who has a model of the printer you'd like to know about.

As a general rule (remember, "general" implies that the statement is not always specifically true), high reliability is most often obtained in products from experienced manufacturers. This is not to say that some of the newer printers aren't highly reliable, simply that they don't have a track record against which you can judge reliability claims.

In a system that has no backups, service availability will become important as your machine sees more and more service. Check if the printer vendor repairs equipment or whether it is sent to someone else. You may not be able to afford a long wait as your malfunctioning printer makes the rounds. Consider purchasing your printer from someone who is close geographically even if the price is slightly higher than a vendor who might be on the other side of the country. If anything goes wrong with your peripheral, turn-around time while the equipment is shipped first one way then the other, the cost of insuring the shipment, and the added danger delicate equipment faces as it is subjected to Postal Service endurance experiments, may often make a more expensive initial investment economic in the long run.

For business users, investigate service contracts. Preventive maintenance is necessary to keep equipment operat-

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CIRCLE 19



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CIRCLE 11

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| T1765 Bubble Memory Term. | 2,795             | 149                 |
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| HAZELTINE 1410 CRT        | 875               | 47                  |
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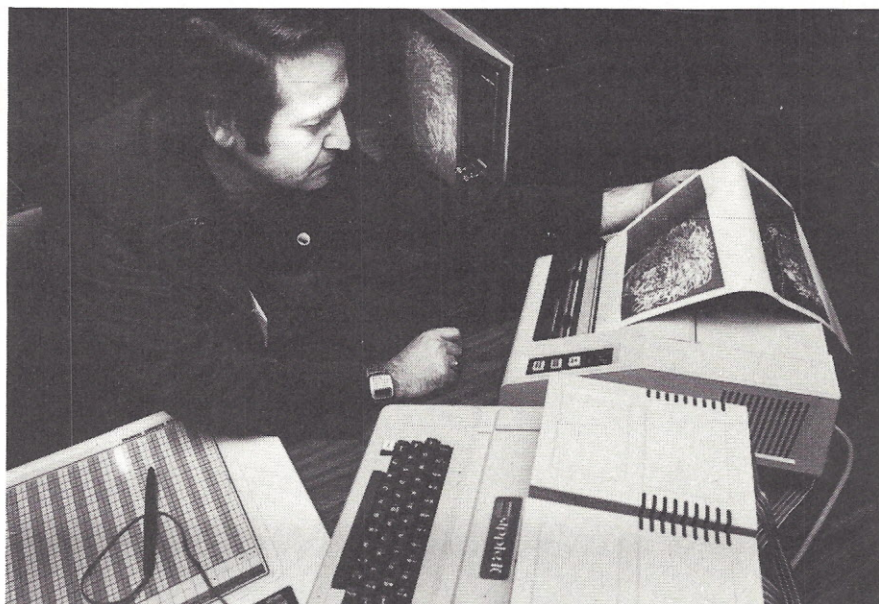
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CIRCLE 12



Dataproducts T-80 Thermal Printer

ing at peak performance.

Maintainability should also occupy some value in your rating scheme; your printer will require expendable supplies such as ribbons, ink, paper, etc. As you narrow your selection field down to fewer and fewer appropriate possible purchases, keep your eyes open for vendors who sell supplies for that model.

If you can get supplies (not always an easy task), someone has to replenish those supplies on the printer itself. If you're in an office atmosphere, can the people who will be responsible for up-keep of the system be able to change type fonts, switch ribbons or load more paper without needing a degree in mechanical engineering?

Having made value judgments as to which factors to consider most heavily in your personal selection process, narrow your packets of promo literature even more. Possibly, you can end up with a small selection of machines that perform the functions you desire with varying degrees of perfection. Judge the options the machines provide to see what, in addition to your basic requirements, you'll get for your printer dollar.

Now that you've done all your research and you narrowed the selection field down to manageable proportions, you enter the final stage of selecting a printer, which is making a choice.

Go back to your original double-column list. Are there any changes to that list you'd like to make now that you've become even more familiar with aspects of the peripheral you might not have considered before? Do the new considerations require re-evaluating? This stage is particularly

important for judging potential future uses of the printer as a valuable, functional addition to your microcomputer system.

Once you have the selection field narrowed to a handful of brands, check them out some more. Try to see each of the machines in operation and listen to them if you can. Watch the individual models be put through their paces by operators who should know what they're doing. Chances are you may not be able to duplicate their skill for a while but at least you'll know what the machine can do.

As the last step before paying your money, double check to be sure you know exactly what is included in the package price. Know whether you will need buffers and cables or an expansion interface, or a controller card, or special software, or . . .

The fateful day will finally arrive when you have to either make a decision or find yourself judging one printer against the other for the rest of your life. Either you have "x" dollars to spend and you'll wind up with a machine that gives you output as close as you desire within your financial constraints; or, as is more likely for a business, you will have to spend a certain amount to achieve that which you desire.

Oh yes, there is one other thing essential to attaching and properly utilizing any peripheral for a microcomputer system; the first thing to do is *read the instructions!* You'd be surprised at the heartache you can save yourself if you take the time to read the directions provided by the manufacturer before you do anything else. Happy hard copy. □



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| 330 | 331 | 332 | 333 | 334 |
| 325 | 326 | 327 | 328 | 329 |
| 320 | 321 | 322 | 323 | 324 |
| 315 | 316 | 317 | 318 | 319 |
| 310 | 311 | 312 | 313 | 314 |
| 305 | 306 | 307 | 308 | 309 |
| 300 | 301 | 302 | 303 | 304 |
| 295 | 296 | 297 | 298 | 299 |
| 290 | 291 | 292 | 293 | 294 |
| 285 | 286 | 287 | 288 | 289 |
| 280 | 281 | 282 | 283 | 284 |
| 275 | 276 | 277 | 278 | 279 |
| 270 | 271 | 272 | 273 | 274 |
| 265 | 266 | 267 | 268 | 269 |
| 260 | 261 | 262 | 263 | 264 |
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| 240 | 241 | 242 | 243 | 244 |
| 235 | 236 | 237 | 238 | 239 |
| 230 | 231 | 232 | 233 | 234 |
| 225 | 226 | 227 | 228 | 229 |

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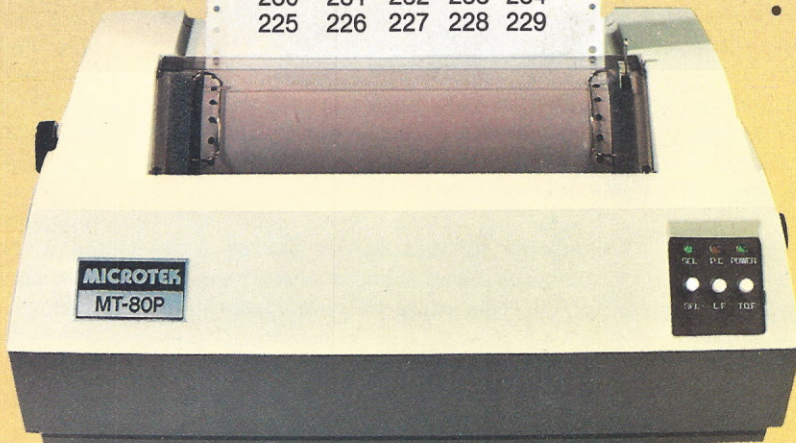
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CIRCLE 18

# RELIABILITY



# Printer Buyer's Guide

—BY KEN MAZUR—

**I**nformation in the accompanying chart comes from questionnaires mailed to firms involved in the printer industry. Following the chart, which provides basic specification data on a variety of printers, is a list of manufacturers and vendors of those products. In cases where a vendor provides more than one brand of printer, we list the models available as indicated by the vendor.

To help you narrow the field, we've listed the units in order of increasing price. Personal users and hobbyists will most likely be interested in the beginning to middle of the chart while business people will want to investigate machines from the middle to the end. In instances where a firm offers a series of printers, the range of prices is shown; contact the vendor for specific information on the cost of a particular unit. Also note that prices for the same model may vary from vendor to vendor. In such cases, either the range is indicated or the instruction "contact vendor" is given in the pricing column. Use the price column of the chart to get an approximation of what a particular unit costs. But remember that options and other factors may alter the price.

If a single figure is listed in the printing speed column, assume that it is the fastest speed of the printer in characters per second (cps). In some cases, a range of speeds indicates that the printer will output at different rates depending upon the parameters under which it is operating.

"Bs" and "Us" listed in the direction column of the chart indicates whether a printer operates unidirectionally (in one direction) or bidirectionally (it prints as the head travels in both directions rather than going through a carriage return before beginning a new line).

"Maximum columns" indicates the number of character columns a machine will print. Some models provide a range of columns depending on specific options or parameters, such as the ability to control the spacing between printed characters.

Buffer size shows whether a printer has an internal buffer and the byte size of that buffer if present.

Machines that provide only upper case printing are indicated with a "U" and those with both upper and lower case character capabilities have a "U/L."

Feed mechanisms have been grouped into friction, tractor and sprocket, with both tractor and friction listed for those machines that come in both versions.

In the "forms" column, "original" indicates that the printer produces a single original, as found as in the case of

thermal, electrosensitive and ink jet printers and several of the impact matrix units. If a printer also has the ability to produce carbon copies, the total that can be expected is indicated with "O" (original) plus "the number of copies." For example, "O + 5" means an original and five copies.

The compatibility portion of the chart will most likely be the hardest to interpret. Our questionnaire requested that the vendor indicate which microcomputer systems were directly compatible with their particular printers without user modification or additional hardware. Some vendors elected to list which interfaces the printer would be compatible with.

Use the chart as a guide to what might interest you or fit your needs. Before ordering any printer, contact the vendor and detail for him the specifications of your microcomputer. Ask whether his printer will work with your machine. In outlining your micro system, you will have to indicate exactly what equipment you have and what options you may have added since its purchase.

For instance, if you tell a vendor you have a TRS-80 and ask whether a printer will work with your machine, the answer could be "yes," with the vendor assuming you already have an expansion interface with an RS-232-C Serial Interface Board installed. The machine is compatible with an RS-232-C, so of course it would work. You, on the other hand, may not take into consideration that to interface with the machine will require an expansion interface (\$299 to \$597 depending on the amount of RAM in the unit) and the RS-232-C board (\$99). That's an expensive misunderstanding.

Contacting vendors may seem time consuming and bothersome for both parties but any businessman should want his customers to be happy and pleased with his product. After all, you might have computer friends and word of mouth advertising is cheap and effective; you may not be the only potential customer the vendor loses if the contact experience is unpleasant or degenerates due to misunderstandings.

All the printers in the chart operate with the ASCII character code with the Trans-Lux Corporation's RO-AH also available in ASCII and Baudot; the Extel AH/P-11R in ASCII or Baudot; and the Anderson-Jacobson AJ832 in ASCII, IBM Correspondence and EBCDIC.

As a final note about the chart interpretation, any column with a dash ("—") in it means that particular piece of information was not available to us at press time.



## Additional Notes

Here's additional information on some of the printer models listed in the chart.

The **Eaton LRC 7000+** is designed specifically for personal computers, according to the company. Its plug-in simplicity makes it easy to interface with any computer and its simple design features the fewest possible moving parts, making it virtually maintenance free, the company said. The 7000+ can print on any type of roll paper, eliminating the need and added expense of purchasing special, treated paper. It has a rugged case for industrial environments but will fit in nicely in a home.

The **Digiclocks Microprinter 100** prints the Commodore Pet 8x8 matrix box in the same way the box is displayed on the screen, including reverse (white on black) character printing.

The printer is complete with all accessories necessary to operate with the Pet. With its fast speed and nominal 1,000,000 lines operation MTBF, the Microprinter gives long troublefree operation with no need of changing ribbons or ink supply.

Operating from a IEEE 488-1975 interface protocol, the printer can be selected from a number of peripherals connected to the Pet.

Panel operating controls provide paper advance, graphics character set select and power on-off.

**Datel's Model AIP-40** is a complete stand-alone impact printer. The AIP-40 prints the standard 64-character ASCII set consisting of uppercase letters, numerals, punctuation and spaces. Lower case letters from the computer are printed as upper case. Characters are formed within a 5 by 7 matrix area with logic controlled optional printing of 10 by 7 double-width characters, corresponding to a 20-column line. The double-width characters offer greater emphasis to printed output.

**RCA Service Company/Data Services** provides the Model 33 ASR, a full character impact printer utilizing paper tape and sprocket feed. The machine, capable of producing an original and two copies, will interface with any microcomputer having a 20/60 mA loop or EIA RS-232-C. The firm provides units on lease with service and provides service contracts to purchase or depot maintenance.

The Silentype by **Apple Computer Inc.** is an advanced text and graphics printer for the Apple II computer. The unit, specifically designed to make new personal computing applications practical by complementing the text-editing and graphics of the Apple II system, makes no distracting noise. It is completely silent when printing and makes only a slight sound when feeding paper to start a new line. Because the printer has few moving parts, it is highly reliable, low in cost and compact, according to the company. In addition, the recently announced extended warranty for the Apple II covers the printer at no extra cost.

The Model 650 CRT Page Printer from **Perkin-Elmer**, interfaces to any CRT terminal equipped with an RS-232-C printer port to produce quality hard copies of video screen displays without interrupting on-going data handling. The Model 650 prints high contrast black-on-white or blue-on-white copies at 100 cps on standard thermal paper. The unit copies a 1920 character CRT screen in less than 20 seconds. An option for the machine is an extended character set for depicting commercial forms. The 650 is silent and compact. It prints by page down the long dimension of the paper to allow for the largest possible characters. The matrix

is 9 by 12, giving clear, readable letters.

**Data Interfaces Inc.** markets a family of low cost dot matrix printers featuring a 7 by 7 or 14 by 7 matrix printing, upper and lower case character set, 100 cps bidirectional printout, roll or fan-fold paper, "finger clean" ribbon cartridge loading and a low 3.5" profile. Complete with electronics, the series is designed to interface directly with mini- and microcomputers. The company says the printer is ideally suited for small business, educational and professional data processing as well as industrial, laboratory and personal computing applications. The machines also have 100 percent duty cycle with a built-in fan.

**MPI Model 88T Impact Matrix Printer** is designed specifically for the general use computer market. Its low cost, design and performance make it is applicable to the small business, educational, personal computing and professional user. The construction and continuous-duty print head allow it to be placed in the heavy usage data processing environment, while the styling complements systems without sacrificing the compact size.

The 88T is capable of printing on roll paper, fan-fold forms or cut sheets using either a pressure roll feed or tractor feed system. The adjustable tractors allow printing on pre-printed forms or continuous labels, varying from 1" to 9.5" in width. An easily inserted long-life ribbon cartridge eliminates the messy ribbon changing. Selectable character densities allow formatting the output in either 80, 96 or 132 character lines. Double wide characters are software selectable for any of the three character densities and can be intermixed on a line for message high-lighting. A full upper and lower case 96 character ASCII set is printed in a 7 x 7 matrix to provide clear copy on the original and up to two copies.

The simplicity of the print mechanism and the maximum use of LSI on a single printed circuit board combine to give reliability and ease of maintenance without sacrificing capability, the company said.

**Matchless Systems** has added a printer to its line of TRS-80 related products that feature a printhead life of 100 million characters. This 80-column, bi-directional, 5 x 7 dot matrix printer utilizes a print mechanism of simple design and high reliability.



Teletype Model 43 KSR

Among the other features are a print speed of 125 cps and a throughput print speed of 63 lpm. The adjustable sprocket feed mechanism allows use of forms from 4-1/2" to 9-1/2" wide, with loading from either the bottom or rear. A full 96 ASCII set permits printing upper and lower case characters, which can be expanded for double-width fonts in bold face. The VFU (Vertical Format Unit) provides preprogrammed/programmable tab positions, top of form and bottom of form.



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In addition to its use with the TRS-80, its Centronics-compatible parallel interface makes it possible to use directly with other computers like Apple, Sorcerer or any standard computer with parallel interface.

**Vitek's** Model 801 and Model 961 (capable of printing 96 columns) highlight simple design and simple mechanics, according to the company. All moving parts (two of them) are permanently lubricated with no pulleys, cables, helices or reels, and drive the print head with one positive, continuous motion.

The firm said the machine prints perfectly, continuously, hour after hour at 132 cps for over 100 million characters with no overheating, print degradation or malfunction. The stepper motor drives tractors to provide precise vertical character positioning. The continuous loop ribbon and reinking roller, automatically driven by the head mechanism, print up to 5 million uniform-density characters before requiring replacement.

**Anderson-Jacobson** offers a number of printers that range from less than \$1000 with its AJ 630 Keyboard Thermal Printer to the higher end AJ832 Keyboard Printer Terminal.

The AJ 630 utilizes an RS-232-C interface as does the firm's AJ 860 Dot Matrix Printer Terminal. The AJ 860 features vertical and horizontal tab stops, complete forms control, APL and graphics character set and a bidirectional forms tractor.

The AJ 832 has options for an APL keyboard, IBM Correspondence and EBCDIC character codes and features high quality daisy wheel printing, high resolution x-y plotting and high speed ultraplot.

**Anadex Inc.** manufactures a series of printers for the microcomputer owner.

The Anadex Apple/Sider Model DP-8000-AP Alpha-numeric Line Printer, a variation of the Model DP-8000, has been tailored specifically for use with Apple computer Business System (Controller). The Model DP-8000-AP will provide 96-characters-per-line printout required by the AR, AP and GL software of the Apple Controller. Movable sprockets allow the use of forms of paper from under 3" to 9-1/2" wide. Models can be supplied with an increased buffer storage register capacity of 2048 characters for CRT dump and other applications.

The standard Model DP-8000 is a completely self-contained printer suited for integration into terminal applications or as a stand-alone printer. It recognizes and prints a 96 character ASCII set. The printer utilizes a 9 by 7 character font printable in 80 columns. Forms width adjustment is similar to the DP-8000-AP version. 1K of FIFO storage is provided in the machine and data may be supplied continuously in applications where the maximum open or closed loop input rate does not exceed 1.4 lines per second. Models can be supplied with increased buffer storage register capacity of 2048 characters. Provisions are also included for indicating when the paper supply has been exhausted.

The Models DP-9500 and DP-9501 are designed for all printer applications including those requiring high density graphics. The Model DP-9500 has a 9 by 9 character font printable in 132 columns and a 7 by 9 font printable in 175 columns which are communications or switch selectable and either can be printed double width by communications demands. The Model DP-9501 has a 11 by 9 font printable in 132 columns and a 7 by 9 font printable in 220 columns. Form width is adjustable from 1" to 15.6" by adjusting the tractor positioning. A Truncate/Wraparound mode is switch selectable to allow either truncating lines containing more

characters than the selected form width and character font allow or print the excess characters on the next line. A heavy duty print head with an estimated life expectancy of 650 million characters is standard as are true graphics under direct control of the data source. The DP-9500 has a resolution of 72 dots per inch vertical and 60 dots per inch horizontal, while the DP-9501 has a resolution of 72 by 75.

The flexibility of 43 teleprinters from **Teletype Corporation** make them attractive for a variety of applications including message communications, time-sharing, computer I/O, order preparation, invoicing and others, according to the firm.

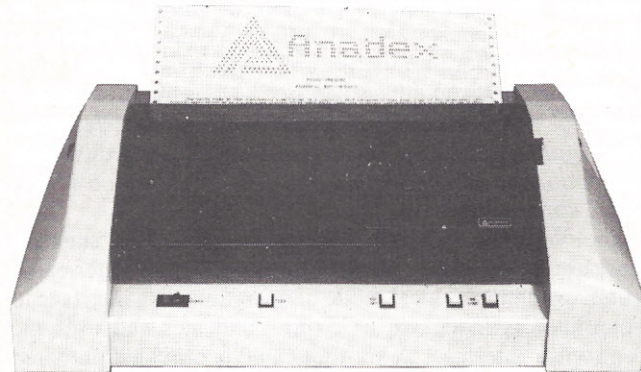
Model 43 teleprinters are easily integrated into most communication systems in use today. In addition to 10 or 30 character per second operation, these ASCII terminals are available with a wide choice of interfaces, operate in either the half or full-duplex mode and include optional parity. And they are compatible with Teletype Corporation's Model 33 terminals.

Configurations include receive only (RO), keyboard send-receive (KSR) and automatic send-receive with paper tape (ASR).

Teleprinters are available in friction feed and pin feed versions: The friction feed 43 lends itself to message traffic and time-sharing applications where text is of indeterminate length. It prints a 72 or 80 character line at 10 characters per inch, and provides up to two copies.

The pinfeed 43 is especially suited for preparing documents such as purchase orders, invoices, and shipping papers. It provides an original and up to five copies (depending upon paper/carbon weight). It's also a good terminal for business reports and tabular listings because it prints up to a full 132 character line at 13 characters per inch on 12" wide by 8-1/2" long fanfold paper. This becomes a handy 11" x 8-1/2" when the 1/2" serrated margins are removed, a convenient size for reproducing and storing using standard office equipment.

**Datasouth Computer Corporation** has introduced a new dot matrix serial printer which the firm claims offers higher throughput than any printer in its price range. The Model



Anadex DP9500

DS180 prints at 180 cps using bidirectional, logic-seeking control of the carriage. Under microscopic control, the printhead automatically performs high speed tabs over blank space in the text and takes the optimum path to the next printable character. Throughput is 500 lpm at 10 characters per line and 75 lpm at 132 characters per line, with typical text printed at 200 lpm. The DS180 uses a 9 x 7 matrix to generate the 96-character ASCII set with true descenders. Standard features include top of form, horizontal and vertical tabs, perforation skip-over, auto line feed, self test, adjustable forms tractors, cartridge ribbons and 110 to 9600 baud.





Siemens printer

All printer parameters are programmable by the user from an integral keypad or via the data stream. A special non-volatile memory retains these settings even when power is switched off.

The compact desk-top packaging has been noise-dampened for quiet operation. The design allows for form feed from the front or bottom of the printer.

**Qume Corporation** puts out a line of daisy wheel printers including the Sprint Micro 3 and Sprint 5 models.

Micro 3, which has three versions that print at 35, 45 and 55 cps, requires a 13 bit parallel interface for strobing and other "handshaking." The machine will do graphic plotting at 5760 plots per square inch. It also has a sheet feeder available for unattended operation, a forms tractor, 94 different printwheels and 20 different types of ribbon to include multicolor, multistrike and single strike fabric.

Sprint 5 comes in either a 45 or 55 cps version. It recognizes 43 command codes, comes with self-test features, offers graphics plotting and has the variety of printwheels and ribbons available for the Micro 3. The Sprint 5 is RS-232-C compatible.

The **Western I/O Inc.** Printer Terminal is a standard character-by-character printer offering full typewriter capabilities when in the local mode of operation. The interface to the printer is made via a 25 pin connector and uses the Centronics Interface. A six-foot cable is provided prewired for the TRS-80 or Apple II systems. If you own another type of system the cable may be rewired to your configuration using the documentation provided. An optional interface and cable is available for the Commodore Pet system or other IEEE-488 bus at additional charge.

The firm's Communications Terminal offers six switch selectable baud rates: 9600, 4800, 2400, 1200, 300 and 110. In addition, a six foot RS-232-C cable is provided to ease interconnection with your system. This terminal has an approximately 1800 character receive buffer, (including space compressed characters) and a 128 character transmit buffer from the keyboard. Full handshake signals are also provided to prevent buffer overflow during use. Standard

terminal keys are also included to provide full flexibility. These keys include: ESC, CNTRL, REPT, DEL, BRK and TEST. The test key provides a full test of the terminal itself. The Communications terminal is microprocessor controlled to provide these enhanced features.

In addition, available as options are: pin feed platen assembly, carbon ribbon, roll paper option (includes tear bar), sound reduction package, alpha lock and IBM Theory of Operation manual, maintenance manual, and complete parts catalogs.

The **Extel** receive-only teleprinter Model AH/P-11R is small and quiet and is silent when idle so that it fits into busy work areas. The teleprinters are available with several options such as direct line connect modem (DLC). Built into the terminal, the DLC option eliminates the need for bulky external line interface boxes. A standard telephone plug connects the unit directly to telephone lines. Standard AH features include a 128 character line buffer to protect against loss of characters when printing short lines — no fill characters needed; bold or expanded characters for text emphasis; last character visibility for message reading during reception and others. The printhead, which prints at speeds of up to 30 cps, is designed to print 300 million characters with little maintenance. The machine also features swappable ASCII and Baudot codes and switchable baud rates (any three up to 300 baud).

The Quick Printer II by **Radio Shack** is a "mini" line printer that can connect directly to your TRS-80 — it needs no Expansion Interface. Software selectable for 16 to 32 character lines, the unit prints upper and lower case and features automatic "wrap-around" when text exceeds line length, so there's no data lost to overflow. A built-in microprocessor controls the printer and communications with other units. With three interface choices, this printer can be used on a variety of computers. The unit provides hard copy output on a 2-3/8"-wide roll of aluminum-coated paper.

The Radio Shack TRS-80 Line Printer III is designed for applications requiring higher speed and full 13-inch wide, 132-character lines.

The 9x7 dot matrix upper and lower case letters, as well as numbers, are printed at a fast 120 characters per second. For even faster throughput, the head prints in *both directions* as it moves across the paper. Accurate positioning of pre-printed forms such as invoices or checks, is easy with controls for line-feed in increments as small as 1/8th-line. Expanded (wide) characters may be software selected for headings or emphasis in your printed reports.

The fully adjustable tractor mechanism feeds continuous forms of varying width up to a maximum of 15 inches, while assuring accurate alignment. Drive motors run only during actual printing.

The **Tally Corporation** T-1602 features microprocessor controlled bi-directional printing to increase throughput efficiency. The print head is directed on the shortest path to the next print position. While moving over blank spaces, the print head is accelerated to three times the printing speed. Plus, the fast slew speed swiftly advances the form. Reports are generated faster, yet the printer isn't working any harder than its rated printing speed. And all this is done without special programs.

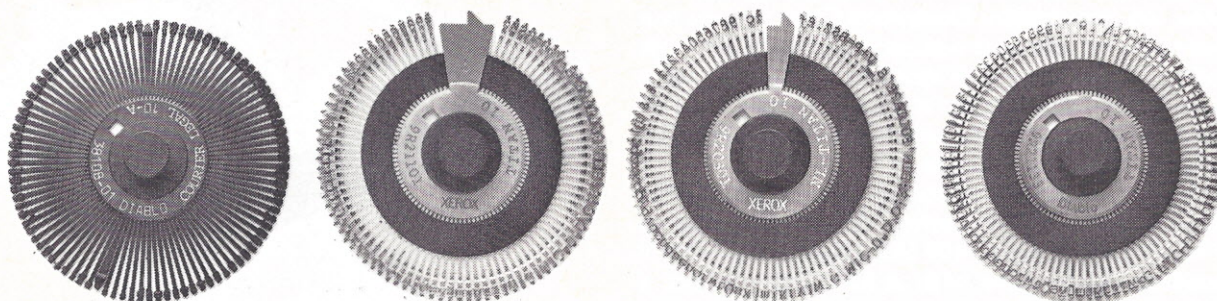
Performance is achieved by mechanical and electronic design techniques that reduce moving parts and increase operating efficiency. Print head movement is controlled by a stepper motor for positive positioning and fast response. No springs or clutches are needed; no adjustments, no warm-up time. Paper advance is likewise stepper motor controlled.



# Diablo introduces the first printer that runs on four wheels.

The Diablo 630 printer is the most versatile printer you can get.

It's the only one that gives you a choice of 4 different interchangeable print wheels and over 100 different type styles.



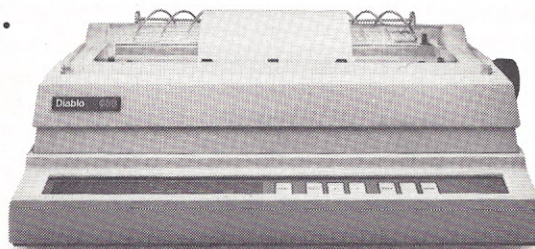
Every 630 works just as well with a 96-character plastic daisy print wheel as it does with an 88, 92, or 96-character metal daisy print wheel.

The 630 also has fewer moving parts than competitive printers, which makes it exceptionally reliable.

This new addition to our line offers unsurpassed print quality. Compatibility with existing Diablo supplies. And automatic bi-directional printing.

The Diablo 630 printer.

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The print quality produced by the T-1602 is achieved by half-space matrix fonts. Two precision rails hold the print head carriage in exact alignment so registration never wavers. Print quality is consistent copy to copy. Dual tractor engagement above and below the print line assures positive alignment and rapid paper advancement.

Designed for office environments, the T-1602 has a styled, acoustically designed enclosure that attenuates the printing noise level down to 55 dBA, quieter than an office typewriter. When not printing, the unit is quiescent. Because Tally's stepper motors provide instant response to a print command, no warm-up is needed.

The high speed, microprocessor controlled Tally M80 MC offers logic seeking bi-directional printing at 200 characters per second. By directing the print head to take the shortest route to the next print position, throughput time can be cut in half.

A feature of the M80 MC is the ability to print OCR A and B, bar code and other special characters. The printer can be equipped with one of three different matrix print heads —  $7 \times 7$ ,  $7 \times 9$ , or  $9 \times 9$ . To optimize forms usage and save paper, line pitch can be switched from 6 to 8 lines per inch and character pitch from 10 to 12, 14 or 16.5 cpi. Print quality is clean, clear and consistent, the company said.

Malibu 165 from **Malibu Electronics Corp.** features two standard character sets, both with upper and lower case with descenders. It also has a high speed font at 165 cps and a letter quality font which prints at 90 cps. Graphics can be handled through complete dot control and the unit provides user programmable character sets.

Interfacing the Malibu to a microcomputer may be done in a number of ways. It will interface to any micro with an S-100 bus and the Malibu S-100 I/O card and cable. It will also connect to any micro with an RS-232-C port and a Malibu Intelligent Serial Controller, and to those computers with a parallel port and a Malibu Intelligent Parallel Controller.

With the Apple Interface, the Model 165 is compatible with Integer Basic, Applesoft, Pascal, The Controller, Applewriter and Easywriter. The Apple II Hi-Res screen can also be easily dumped to the printer in different sizes and modes.

**General Electric Data Communication Products** TermiNet 200 line printer prints at 200 characters per second. Its printhead advances at 60 inches per second. It moves paper at 20 inches per second.

The 200 offers a choice of four print compressions. So if you need 10 and 12.94 characters per inch now, and 15 or 16.5 later on, all four are already built into the machine. You also have a choice of 136 print columns, 176, 204 or 224. A convenient switch lets the operator choose to print 6 or 8 lines per inch. As a teleprinter, the TermiNet 200 offers a choice of 10, 20, 30 or 120 cps print speed, also switch-controlled.

The tractors adjust from either end of the carriage to accommodate various width forms from 2 inches to 16-1/2 inches. Crisp, clean printing on up to 9-part forms is standard. And paper can be front- or rear-loaded.

The printer can be changed from Keyboard Send/Receive to Receive Only, and to line printer and back again simply by changing out the keyboard/control panel and two circuit boards. A qualified service technician can do the job in 30 minutes.

Whether you need a low speed throughput or a high speed throughput, you have a whole range of choices with the TermiNet 310, 320, 330 and 340 line printers to match your requirements.

The line rate for the four new TermiNet line printers varies with the number of printable characters per line and the size of the ASCII subset. For example, the TermiNet 340 line printer's throughput for a 64 character ASCII subset averages 340 lines per minute when 90 or fewer characters are printed on a line. This includes one line feed per line. When printing characters in all 132 columns the minimum throughput is 231.87 lines per minute. Printing 132 characters per line, the throughputs for the rest of the family are: the TermiNet 330 — 181.1 lpm, TermiNet 320 — 115.9 lpm and TermiNet 310 — 90.9 lpm.

Ribbon cartridge can be replaced in less than a minute but, with the Mobius loop feature, the TermiNet ribbon cartridge has a life of 100 million print characters, or more than 500,000 typical lines.

There are very few restrictions on the number of different forms you can handle with this family of line printers. Six part forms can be used, an original plus five copies with excellent print quality. There are adjustable tractors for centering forms three to 15 inches wide.



Centronics 753

The Quietype from **Silonics Inc.** can be connected to any computer offering an RS-232-C, 50 to 2400 baud output, or a Centronics-type parallel interface. The Quietype's major advantage is that by using drop-on-demand ink jet technology, it is quiet and well suited for office or home.

A high speed version of the **Siemens** silent ink-jet PT80, the PT-80i features bidirectional printing at 270 cps. The printing head, which includes the 12 ink-jet elements, is capable of printing 127 characters in a 12 by 9 dot matrix from either one of two character generators and free to choose character elements for printing logos, symbols, etc. Italics is an optional feature; continuous underline is standard.

The PT-80i is microprocessor controlled with an 8085 chip. The control provides, in addition to the standard parallel interface of the original PT-80, an extended system information bus interface to allow external connection of



network selectors, data sets and additional storage devices such as floppy disks.

**Sanders** has incorporated what it considers to be the best features of the dot matrix, daisy wheel, ink jet and ball element printing technologies into a single package — the Media 12/7. The printer varies its speed according to the quality of type that you want. At its fastest speed, with a single pass of the print head, the characters look similar to those of a typical wire matrix printer but the quality is better because the dots are more closely spaced. Single pass typefaces are ideal for producing drafts at high speeds, and four pass fonts produce fully formed characters of typewriter quality. The Infinite Matrix principle, a patented development by the company, has the ability to place a dot anywhere on a page to within 1 mil accuracy. A few simple commands will control a wide variety of text handling functions. The highly sophisticated software, resident within the printer, performs all the calculations required to manipulate text without operator intervention.

**Florida Data Corp.**, in production just over a year with 900 printers installed, claims to have introduced the fastest matrix printer on the market at 600 characters per second, which it says is more than twice the speed of any previously available printer. The company has also introduced a 900 cps version with compressed 15 characters per inch. The printer is the result of more than two years in the development of a proprietary print head using a "magnetic stored energy" hammer rather than traditional solenoid hammers. In the BNY model, graphics can be accomplished by shifting, under program control, into a direct-addressable mode with 128 dots per inch vertical and horizontal resolution.

The Quiet 300 from **Local Data** features the Teletype model 40 print mechanism. This mechanism is a heavy duty, line at a time, hard copy, impact printer, which prints crisply on up to six part forms. The Quiet 300 is capable of 300 full lpm with the ASCII 63 character set, and 440 lpm with the 48 character set. This unit provides a tractor feed mechanism with either the 80 column or 132 column printer.

Due to its carrier system and full character type pallets, the Quiet 300 can produce clean, sharp copy. The type pallets are held by a continuous loop carrier, and each print position has its own print hammer; thus, each hammer is operated only once during an entire length of printing, producing even wear across the printer.

The full ASCII character set (96 characters) or the mono case (63 characters) are standard options. A total of 192 characters can be printed by extending the ASCII character set by using the 8th bit.

Quiet 300 is available in floor model cabinets. The floor model cabinet allows for enclosed paper handling, for quiet operation. Paper sizes from 2-1/2" to 22" in length and variable widths can be accommodated by the tractor feed mechanism.

The Quiet 300 is available with a standard parallel and buffered serial RS-232-C interface.

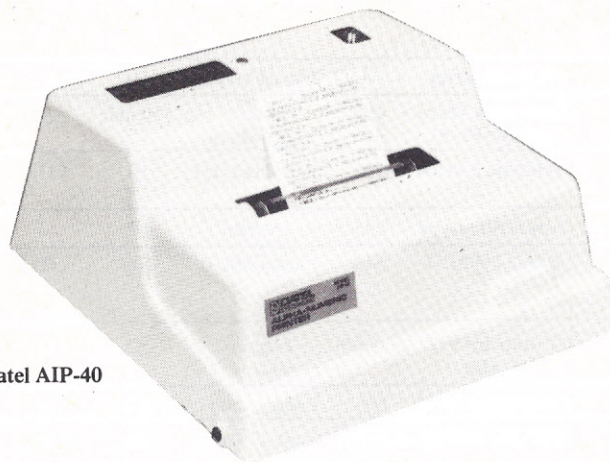
The new M-120 printer by **Dataproducts, Inc.**, provides crisp, easy-to-read print using a 7 × 7 half-dot matrix font in standard or expanded characters, the company said. The print speed is 180 cps in a bidirectional, logic-seeking mode. Average throughput is 120 lines per minute. Other significant features of the M-120 include an operator replaceable head, good for more than 200 million characters; long-life ribbons in clean and easy to load cassettes; and no required preventive maintenance. The M-120 includes a built-in self-test feature. An optional LED diagnostic display shows which cycle the printer was in at the time it went off-line,

allowing operator correctable conditions to be handled without a service call.

A new family of daisy-wheel printers and terminals, the D-50 series developed by Dataproducts Corporation, has three basic configurations — a printer with parallel-interface, a receive-only terminal, and a keyboard send-receive terminal. All print at speeds up to 50 characters per second. The printer and terminals are designed for quiet operation in word-processing, small-business and remote data-processing systems requiring letter-quality output.

All D-50 models use standard 96-character daisy-wheels, providing a wide range of font styles including domestic and foreign language sets. The spindle will accept daisy wheels from Dataproducts or other manufacturers, making a broad range of type fonts and type sizes readily available.

The D-50 hammer mechanism is a sealed, direct-action solenoid with no mechanical linkages, precluding the paper-



Datel AIP-40

particle and dust clogging normally associated with daisy-wheel print mechanisms. For longer wheel life, hammer impact is programmable through eight intensities to accommodate characters of different sizes and give better control over printing impressions.

An off-carriage ribbon system holds 120 yards of single-strike film or 50 yards of multi-strike fabric ribbon.

A graphic option for the microprocessor-controlled Dataproducts T-80 thermal-matrix printer permits interspersed graphics and text at a cost below that of conventional plotters, the company said.

The graphic printer can be used for quick-look evaluation of engineering, scientific, medical and industrial data or other applications where immediate examination of plotted information is desired.

The T-80 is a five-by-seven dot-matrix printer which operates at 80 characters per second. When graphing, it employs a raster scan technique sequentially energizing any of the seven vertical dots. Both vertical and horizontal spacing is 70 dots per inch giving 4900 points per square inch.

Headings, legends, values or any other text may be printed simultaneously with graphing. A standard 96-character ASCII character set is contained in ROM. Character spacing is ten per inch with six horizontal lines per inch.

The T-80 employs an operator-replaceable print head that permits printing on the fly without stopping or lifting the head between characters. Head life is 20 million characters. The printer uses conventional thermal-paper rolls, 8-3/4" inches wide by 200 feet long, available from Dataproducts, 3M, NCR, Nashua and Jujo. Standard interfaces include 8-bit Dataproducts or Centronics-type parallel interfaces and an RS-232 20mA current loop serial interface. On-board switches permit data rates from 110 baud to 9600 baud. □



# Printer Comparison Chart

| Model                          | Price   | Print Mec                      | Speed   | Direction | Max Cols | Buffer   | Upper/<br>Lower | Fd Mech                 | Forms    | Compatible                                                                            |
|--------------------------------|---------|--------------------------------|---------|-----------|----------|----------|-----------------|-------------------------|----------|---------------------------------------------------------------------------------------|
| Radio Shack Quick Printer II   | 219     | Electrosensitive               | 120 lps | U         | 16-32    | None     | U/L             | Friction                | Original | RSI                                                                                   |
| LRC 7000+                      | 389     | Impact Matrix                  | 1¼ lps  | U         | 64       | —        | U               | Friction                | Original | AP2/Z2/TI/ES/<br>OS/Pet                                                               |
| Digiclocks 100                 | 390     | Electrosensitive               | 144     | U         | 48       | 48       | U/L             | Friction                | Original | Pet                                                                                   |
| DigiTec 6400                   | 407     | Electrosensitive<br>or Thermal | 80      | U         | 32       | 35       | U               | Friction                | Original | —                                                                                     |
| Axiom EX-80i-P                 | 445     | Electrosensitive               | 160     | U         | 80       | 512      | U/L             | Friction                | Original | A/AP2/AP2+/Z2/<br>H8/H11/IM/NS/OS/<br>CP/SOL/ES/RSI/VG                                |
| AIP-40 series                  | 470-690 | Impact Matrix                  | 50      | U         | 40       | 120-200  | U               | Friction                | O + 1    | All                                                                                   |
| Centronics Micro-printer P1/S1 | 495     | Matrix<br>Electrostatic        | 150 lpm | —         | —        | 192      | U/L             | Friction                | Original | Serial RS-232-C<br>Parallel Centronics                                                |
| Teletype 33ASR                 | 550     | Full Character<br>Impact       | 10      | U         | 72       | None     | U               | Sprocket                | O + 2    | 20mA loop or EIA<br>RS-232-C                                                          |
| Apple Silentype                | 595     | Thermal                        | 40      | —         | 80       | —        | U/L             | Friction                | Original | AP2                                                                                   |
| Base2 800MST                   | 649     | Impact Matrix                  | 100     | B         | 132      | 1920     | U/L             | Friction and<br>Tractor | O + 2    | IEEE 488, RS-232,<br>20mA loop, Cen-<br>tronics Parallel                              |
| Comprint 912 Series            | 660-699 | Electro-<br>sensitive          | 225     | U         | 80       | 256      | U/L             | Friction                | Original | AP2/AP2+/CC/OS/<br>CP/TI/RSI                                                          |
| Centronics 730-1               | 695     | Impact Matrix                  | 100     | U         | 132      | None     | U               | Tractor                 | —        | AP2/AP2+                                                                              |
| DIP-80, DIP-84                 | 695-795 | Impact Matrix                  | 100     | B         | 132      | 160      | U/L             | Friction/<br>Tractor    | O + 3    | RS-232-C, Cen-<br>tronics Parallel                                                    |
| MPI 88T                        | 749     | Impact Matrix                  | 100     | U & B     | 132      | 2 lines  | U               | Tractor/<br>Friction    | O + 2    | AL/AP2/AP2+/CC/<br>Z2/DG/H8/H11/HP/<br>IM/NS/OS/Pet/SOL/<br>ES/SW/TI/RSI/RSII/<br>TDL |
| Microtek MT-80P                | 750     | Impact Matrix                  | 125     | B         | 80       | 80       | U/L             | Tractor                 | O + 3    | AL/AP2/AP2+/Z2/<br>H8/H11/IM/<br>NS/OS/RSI/VG                                         |
| Superbrain Emako 22            | 795     | Impact Matrix                  | 125     | B         | 132      | 1 line   | U/L             | Tractor                 | O + 3    | RS-232-C<br>20 mA loop<br>Centronics compatible                                       |
| Centronics 730                 | 795     | Impact Matrix                  | 100     | U         | 80       | 80       | U/L             | Friction                | O + 3    | AL/AP2/AP2+/Z2/<br>H8/H11/IM/NS/OS/<br>Pet/SOL/ES/RSI/<br>RSII/VG                     |
| Heath WH-14                    | 795     | Impact Matrix                  | 30-165  | U         | 132      | 256      | U/L             | Tractor                 | O + 2    | RS-232<br>w/handshaking                                                               |
| Microtek MT80                  | 795     | Impact Matrix                  | 125     | B         | 120      | Up to 4K | U/L             | Tractor                 | O + 3    | RS-232,<br>Centronics                                                                 |
| Pet 2027                       | 795     | Impact Matrix                  | 90      | U         | 132      | 256      | —               | Tractor                 | O + 4    | Pet                                                                                   |
| Matchless MS-204               | 795     | Impact Matrix                  | 125     | B         | 132      | 132      | U/L             | Sprocket                | O + 2    | AP2/AP2+/Z2/IM/<br>NS/RSI/RSII/<br>S-100 parallel                                     |

## Key to Abbreviations

AL = Altair 8800-b;  
 AP2 = Apple II;  
 AP2+ = Apple II Plus;  
 BA = Bally Arcade;  
 CC = CompuColor II;  
 DG = Digital Group;  
 ES = Exidy Sorcerer;

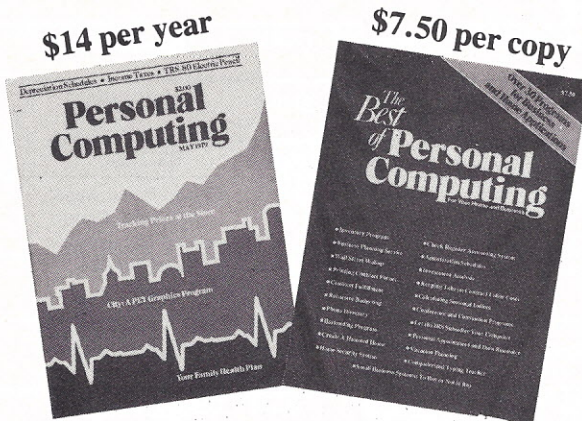
H8 = Heath/Zenith H8;  
 H11 = Heath/Zenith H11;  
 HP = Hewlett-Packard HP 85;  
 IM = Imsai 8080;  
 NS = North Star Horizon;  
 OS = Ohio Scientific Challenger;  
 Pet = Commodore Pet;

RSI = Radio Shack TRS-80 Mod I;  
 RSII = Radio Shack TRS-80 Mod II;  
 SOL = Processor Tech Sol-20;  
 SW = SWTP 68/2;  
 TDL = Technical Design Labs Xitan;  
 TI = Texas Instruments 99/4;  
 VG = Vector Graphic Vector I;  
 Z2 = Cromemco Z2.



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# Printer Comparison Chart

| <i>Model</i>                              | <i>Price</i>  | <i>Print Mec</i> | <i>Speed</i> | <i>Direction</i> | <i>Max Cols</i> | <i>Buffer</i>   | <i>Upper/<br/>Lower</i> | <i>Fd Mech</i>             | <i>Forms</i> | <i>Compatible</i>                                                                 |
|-------------------------------------------|---------------|------------------|--------------|------------------|-----------------|-----------------|-------------------------|----------------------------|--------------|-----------------------------------------------------------------------------------|
| Telpar PS48I                              | 799           | Thermal          | 24           | U                | 48              | 1 line          | U/L                     | Friction                   | Original     | AP2/AP2+/BA/CC/<br>HP/TI/RSI/RSII                                                 |
| Vitek 801                                 | 895           | Impact Matrix    | 132          | U                | 80              | 127             | U                       | Tractor                    | O + 5        | AL/AP2/AP2+/CC/<br>Z2/DG/H8/H11/HP/<br>IM/NS/OS/SOL/ES/<br>SW/RSI/RSII/VG/<br>TDL |
| Vitek 961                                 | 895           | Impact Matrix    | 132          | —                | 96              | 127             | U                       | Tractor                    | O + 5        | Same as Vitek 801                                                                 |
| Okidata<br>Microline 80                   | 945           | Impact Matrix    | 80           | U                | 132             | 132             | U/L                     | Friction, Tractor (option) | O + 2        | AP2/AP2+/RSI/<br>RSII/Centronics<br>compatible                                    |
| Centronics 737                            | 995           | Impact Matrix    | 80           | —                | 80              | 1 line          | U/L                     | Friction/<br>Pinfeed       | —            | Parallel                                                                          |
| Paper Tiger<br>IDS 440                    | 995-<br>1040  | Impact Matrix    | 120-198      | U                | 132             | 256<br>2K op    | U                       | Tractor                    | O + 3        | Centronics,<br>RS-232-C                                                           |
| Anderson-<br>Jacobson 630                 | 995           | Thermal          | 30           | U                | 140             | None            | U/L                     | Tractor                    | Original     | RS-232-C                                                                          |
| Anadex<br>DP-8000AP                       | 995           | Impact Matrix    | 112          | B                | 80              | 1000            | U/L                     | Tractor                    | O + 3        | AP2/AP2+                                                                          |
| Anadex<br>DP-8000                         | 995           | Impact Matrix    | 112          | B                | 80              | 1000            | U/L                     | Tractor                    | O + 3        | All systems using<br>serial or parallel<br>interfaces                             |
| Printerm 877                              | 999           | Impact Matrix    | 120          | B                | 80              | 256             | U/L                     | Friction                   | O + 2        | RS-232-C                                                                          |
| Data Royal<br>Series 5000                 | 1195-<br>1375 | Impact Matrix    | 150          | B                | 132             | 256             | U/L                     | Tractor                    | O + 3        | CC/ES/TI/<br>RSI/RSII                                                             |
| Perkin-Elmer<br>Pussycat 650              | 1262          | Thermal          | 100          | Fixed            | 80              | 1920 or<br>3840 | U/L                     | Friction                   | Original     | RS-232                                                                            |
| Printerm 879                              | 1299          | Impact Matrix    | 120          | B                | 132             | 256             | U/L                     | Friction/<br>Tractor       | O + 3        | RS-232-C                                                                          |
| Teletype<br>Model 43-RO                   | 1362          | Impact Matrix    | 30           | U                | 132             | 64              | U/L                     | Tractor                    | O + 2        | EIA RS-232                                                                        |
| Miniterm 1201                             | 1385          | Thermal          | 50           | U                | 80-132          | 2K op           | U/L                     | Friction                   | Original     | RS-232-C                                                                          |
| Datasouth<br>DS-180                       | 1395          | Impact Matrix    | 180          | B                | 132             | 1000            | U/L                     | Tractor                    | O + 5        | RS-232-C and 20mA<br>loop serial, Cen-<br>tronics compatible                      |
| Sprint Micro 3                            | 1435          | Daisy Wheel      | 35-55        | B                | 132             | —               | U/L                     | Friction/<br>Tractor       | O + 6 to 10  | 13 bit parallel<br>interface                                                      |
| Western I/O<br>Printer Terminal           | 1495          | Ball             | 148          | U                | 132             | None            | U/L                     | Friction/<br>Tractor       | O + 5        | Centronics                                                                        |
| Teletype<br>Model 43-KP                   | 1528          | Impact Matrix    | 30           | U                | 132             | 64              | U/L                     | Tractor                    | O + 2        | RS-232, 20mA loop                                                                 |
| Di-An Model 60                            | 1595          | Impact Matrix    | 60           | U                | 132             | 68              | U/L                     | Tractor                    | O + 7        | RS-232-C, 20mA loop                                                               |
| Western I/O<br>Communications<br>Terminal | 1595          | Ball             | 14.8         | U                | 132             | 1850            | U/L                     | Friction/<br>Tractor       | O + 5        | RS-232-C                                                                          |
| Anadex DP-9500                            | 1650          | Impact Matrix    | 150-200      | B                | 132-175         | 700             | U/L                     | Tractor                    | O + 5        | AL/AP2/AP2+/CC/<br>Z2/DG/H8/H11<br>IM/NS/OS/SOL/ES/<br>SW/TI/RSI/RSII/VG/<br>TDL  |
| Anadex DP-9501                            | 1650          | Impact Matrix    | 120-220      | B                | 132-220         | 700             | U/L                     | Tractor                    | O + 5        | Same as DP-9500                                                                   |
| Extel AH/P-11R                            | 1690          | Impact Matrix    | 30           | U                | 80              | 128             | U                       | Friction                   | O + 2        | Standard Interfaces                                                               |
| Heath WH-24/<br>TI-810                    | 1695          | Impact Matrix    | 150          | B                | 132             | 256             | U/L                     | Tractor                    | O + 5        | RS-232 w/hand-<br>shaking at high<br>baud rates                                   |
| Radio Shack<br>Line Printer III           | 1960          | Impact Matrix    | 120          | B                | 132             | —               | U/L                     | Tractor                    | O + 4        | RSI/RSII                                                                          |



# Printer Comparison Chart

| Model                      | Price           | Print Mec             | Speed   | Direction | Max Cols             | Buffer     | Upper/<br>Lower | Fd Mech          | Forms     | Compatible                                                       |
|----------------------------|-----------------|-----------------------|---------|-----------|----------------------|------------|-----------------|------------------|-----------|------------------------------------------------------------------|
| Execuport 4000 series      | 1975-3495       | Impact Matrix         | 30      | U         | 80-136               | None       | U               | Friction         | Original  | EIA RS-232                                                       |
| Mannesman Tally 1602-1605  | 1995            | Impact Matrix         | 160     | B         | 132                  | 665        | U/L             | Tractor          | O + 5     | AL/AP2/AP2+/Z2/H8/H11/HP/IM/NS/OS/Pet/TI/RSI/RSII                |
| Centronics 704             | 2150            | Impact Matrix         | 180     | B         | 132                  | 256        | U/L             | Tractor          | O + 3     | AL/AP2/AP2+/CC/Z2/H8/H11/HP/IM/NS/OS/Pet/SOL/ES/TI/RSI/RSII/VG   |
| Malibu 165                 | 2395            | Impact Matrix         | 165     | B         | 132                  | 750        | U/L             | Tractor          | O + 5     | S-100 bus, RS-232-C Parallel port                                |
| Terminet 200               | 2350            | Impact Matrix         | 120     | U         | 132                  | —          | U/L             | Tractor          | O + 8     | RS-232 or Centronics                                             |
| Mannesman Tally M80        | 2445            | Impact Matrix         | 200     | B         | 80-132               | 132        | U               | Tractor          | O + 5     | Same as Tally 1602                                               |
| Quietype RO                | 2495            | Ink Jet               | 210     | B         | 132                  | 132        | U/L             | Friction         | Original  | RS-232-C, Centronics                                             |
| Diablo HiType II           | 2500            | Daisy Wheel           | 45      | B         | 158                  | None       | U/L             | Friction         | O + 5     | Requires controller to match 12 bit parallel interface to micro  |
| Sprint 5 RO & KSR          | 2595-3275       | Daisy Wheel           | 45-55   | B         | 132                  | 224        | U/L             | Friction/Tractor | O+6 to 10 | RS-232                                                           |
| Di-An Model 120            | 2595            | Impact Matrix         | 120     | U         | 132                  | 68         | U/L             | Tractor          | O + 7     | RS-232-C, 20mA loop                                              |
| Anderson-Jacobson AJ860    | 2600            | Impact Matrix         | 140     | B         | 132                  | 350        | U/L             | Tractor          | O + 5     | RS-232-C                                                         |
| Centronics 753             | 2895            | Impact Matrix         | 130-150 | B         | 132                  | —          | U/L             | Tractor          | —         | Parallel                                                         |
| Heath WH-44/Diablo 1640    | 2895            | Daisy Wheel           | 45      | B         | 132-158              | 256        | U/L             | Friction/Tractor | O + 5     | RS-232                                                           |
| Spinwriter 5510/5515       | 2995            | Thimble               | 55      | —         | 136-163              | 256        | U/L             | Friction/Tractor | O + 7     | AP2/AP2+/H8/Pet/ES                                               |
| System 75 Model X          | 3395            | Daisy Wheel           | 45      | B         | 158                  | 90         | U/L             | Friction/Tractor | O + 5     | RS-232                                                           |
| Anderson-Jacobson AJ832    | 3495            | Daisy Wheel           | 45      | U         | Variable             | Up to 1792 | U/L             | Friction/Tractor | O + 5     | RS-232-C/CCITT                                                   |
| Siemens PT80i              | 3500-5000       | Ink jet               | 10-270  | B         | 132                  | 16K-200K   | U/L             | Friction/Tractor | O + 5     | RS-232-C                                                         |
| Sanders Media 12/7         | 3900            | Impact Matrix         | 30-216  | B         | 13.2 inch print line | —          | U/L             | Friction         | O + 3     | RS-232-C, Centronics                                             |
| Florida Data 600A, 600C    | 4300            | Impact Matrix         | 600-900 | B         | 132                  | 800        | U/L             | Tractor          | O + 7     | RS-232 or parallel available                                     |
| Local Data Quiet 300 FA-80 | 4395            | Full Character Impact | 400     | U         | 80                   | 1024       | U/L             | Tractor          | O + 5     | AP2/AP2+/Z2/H11/IM/NS/OS/SOL/ES/TI/RSII                          |
| Local Data Quiet 300/132   | 4995            | Full Character        | 400     | U         | 132                  | 1024       | U/L             | Tractor          | O + 5     | Same as Model FA-80                                              |
| Terminet 340               | 5140            | Rotating Belt         | 340 lps | U         | 132                  | —          | U/L             | Tractor          | O + 5     | RS-232 or Centronics                                             |
| Southwest Data SDS P-300   | 6900            | Impact Matrix         | 300 lpm | U         | —                    | line       | U/L             | Tractor          | O + 7     | Centronics Data-products interface                               |
| Dataproducts M-120/M-200   | Contact Company | Impact Matrix         | 180-340 | B         | 132                  | 1000       | U/L             | Tractor          | O + 5     | 8 bit parallel RS-232-C (option) Centronics (option)             |
| Trans-Lux Corp RO-AH       | Varies          | Impact Matrix         | 30      | U         | —                    | None       | U               | Friction/Tractor | O + 2     | Polar or neutral DC 10-80 mA polar; 20-60 mA neutral; RS-232-C   |
| Dataproducts D-50          | Contact Company | Daisy Wheel           | 50      | B         | 132-158              | 256        | U/L             | Friction/Tractor | O + 5     | —                                                                |
| Dataproducts T-80          | Contact Company | Thermal               | 80      | U         | 80                   | 2000       | U/L             | Friction         | Original  | RS-232-C, 20mA loop Dataproducts parallel, Centronics compatible |



# Printer Vendor Guide

**AB Computers**  
115 E. Stump  
Montgomeryville, PA 18936  
Pet, Anderson-Jacobson,  
Heath  
*Circle 170*

**Addmaster Corp.**  
416 Junipero Serra Dr.  
San Gabriel, CA 91776  
*Circle 171*

**Advanced Computer Products**  
P.O. Box 17329  
Irvine, CA 92713  
Centronics  
*Circle 172*

**Agile Corp.**  
1050 Stewart Dr.  
Sunnyvale, CA 94086  
*Circle 173*

**Alanthus Data Comm. Corp.**  
6011 Executive Blvd.  
Rockville, MD 20852  
*Circle 174*

**American Square Computers**  
Kivett Drive  
Jamestown, NC 27282  
Microtek, Anadex, Florida  
Data  
*Circle 175*

**Amperex Electronic Corp.**  
230 Duffy Ave.  
Hicksville, NY 11802  
*Circle 176*

**Anadex Inc.**  
9825 DeSoto Ave.  
Chatsworth, CA 91311  
DP-8000-AP, DP-8000,  
DP-9500, DP-9501  
*Circle 177*

**Anderson-Jacobson Inc.**  
521 Charcot Ave.  
San Jose, CA 95131  
AJ630, AJ832, AJ860  
*Circle 178*

**Apple Computer, Inc.**  
10260 Bandley Dr.  
Cupertino, CA 95014  
*Circle 179*

**Applied Computer Systems**  
617 N. Mary Ave.  
Sunnyvale, CA 94086  
*Circle 180*

**Apparat Inc.**  
6000 E. Evans Ave.  
Bldg. 2  
Denver, CO 80222  
Centronics  
*Circle 181*

**AT & T Inc.**  
195 Broadway  
New York, NY 10007  
*Circle 182*

**A-Vidd Electronics Co.**  
2210 Bellflower Blvd.  
Long Beach, CA 90815  
*Circle 183*

**Axiom Corp.**  
5932 San Fernando Rd.  
Glendale, CA 91202  
EX-80i-P  
*Circle 184*

**Base 2, Inc.**  
P.O. Box 3548  
Fullerton, CA 92634  
Base 2 800MST  
*Circle 185*

**Bedford Computer Systems**  
Three Preston Court  
Bedford, MA 01730  
Diablo HiType II, System 75  
Model X  
*Circle 186*

**Benson-Varian Inc.**  
385 Ravendale Dr.  
Mountain View, CA 94043  
*Circle 187*

**Bowmar Instrument Corp.**  
8000 Bluffton Rd.  
Fort Wayne, IN 46899  
*Circle 188*

**Burroughs Corp.**  
Room 4D20  
Burroughs Place  
Detroit, MI 48232  
*Circle 189*

**Business Systems Tech.**  
3015 Daimler St.  
Santa Ana, CA 92705  
*Circle 190*

**Byte Shop**  
674 El Camino Plaza  
Tustin, CA 92680  
Centronics  
*Circle 191*

**C & S Electronics Mart**  
32 E. Main St.  
Milan, MI 48160  
*Circle 192*

**Canon U.S.A. Inc.**  
10 Nevada Dr.  
Lake Success, NY 11042  
*Circle 193*

**Centronics**  
One Wall St.  
Hudson, NH 03051  
*Circle 194*

**Century Data Systems**  
1270 N. Kraemer  
Anaheim, CA 92806  
*Circle 195*

**CFR Associates, Inc.**  
Newton, NH 03858  
Diablo, Centronics, Selectrics  
*Circle 196*

**Clary Corp.**  
320 W. Clary Ave.  
San Gabriel, CA 91776  
*Circle 197*

**ComData Corp.**  
8115 Monticello Ave.  
Skokie, IL 60076  
*Circle 198*

**Commodore Business Machines**  
3330 Scott Blvd.  
Santa Clara, CA 95050  
*Circle 199*

**Computer City**  
175 Main St.  
Charlestown, MA 02139  
Centronics, NEC  
*Circle 200*

**Computer Components of Orange County**  
6791 Westminster Ave.  
Westminster, CA 92683  
Centronics  
*Circle 315*

**Computer Corner**  
439 Rt. 23  
Pompton Plains, NJ 07444  
*Circle 316*

**Computer Devices Inc.**  
25 North Ave.  
Burlington, MA 01803  
Miniterm 1201  
*Circle 317*

**Computer Factory**  
485 Lexington Ave.  
New York, NY 10017  
Centronics, IDS, Pet,  
Anderson-Jacobson  
*Circle 318*

**Computer Generated Data**  
700 Baker Rd. Suite 115  
Virginia Beach, VA 23462  
Data Royal Series 5000,  
Centronics, TI, Anadex,  
Comprint  
*Circle 319*

**Computer Interface Tech. Peripheral Products Div.**  
2080 South Grand  
Grand Centre  
Santa Ana, CA 92705  
Centronics  
*Circle 320*

**Computers Printers International Inc. (COMPRINT)**  
340 E. Middlefield Rd.  
Mountain View, CA 94043  
Comprint 912  
*Circle 321*

**Computer Terminal Systems**  
52 Newton Plaza  
Plainview, NY 11803  
*Circle 322*

**Computer TexTile**  
10960 Wilshire Blvd.  
Suite 1504  
Los Angeles, CA 90024  
Qume, DIP, Sanders 12/7  
*Circle 323*

**Computer Tranceiver Systems**  
East 66 Midland Ave.  
Paramus, NJ 07652  
Execuport 4000  
*Circle 324*

**Data Access Systems, Inc.**  
100 Route 46  
Mountain Lakes, NJ 07046  
*Circle 325*

**Data & Technik Corp.**  
24 Avon Circle  
Needham Heights, MA 02194  
*Circle 326*

**Data Discount Center**  
135-53 Northern Blvd.  
P.O. Box 100  
Flushing, NY 11354  
Centronics, TI810, Teletype  
*Circle 327*

**Datadyne Corp.**  
Bldg. 37A  
Valley Forge Center  
King of Prussia, PA 19406  
*Circle 328*

**Data Group Inc.**  
2605 S.W. Temple St.  
Salt Lake City, UT 84115  
*Circle 329*

**Data Interface Inc.**  
210 Lincoln St.  
Boston, MA 02111  
DIP80, DIP84  
*Circle 330*

**Data Printer Corp.**  
99 Middlesex St.  
Malden, MA 02148  
*Circle 331*

**Dataproducts Corp.**  
6200 Canoga Ave.  
Woodland Hills, CA 91365  
M-120, M-200  
*Circle 332*

**Dataroyal Inc.**  
Main Dunstable Rd.  
Nashua, NH 03060  
*Circle 333*

**Datasouth Computer Corp.**  
4740 A Dwight Evans Rd.  
Charlotte, NC 28210  
DS-180  
*Circle 334*

**Data Terminals & Comm.**  
590 Division St.  
Campbell, CA 95008  
*Circle 335*

**Data Test Corp.**  
2450 Whitman Rd.  
Concord, CA 94518  
*Circle 336*

**Datel Intersil, Inc.**  
11 Cabot Blvd.  
Mansfield, MA 02048  
AIP40 Series  
*Circle 337*

**Davilyn Corp.**  
13406 Satcoy St.  
No. Hollywood, CA 91605  
*Circle 338*

**Decision Data Corp.**  
100 Witner Rd.  
Horsham, PA 19044  
*Circle 339*

**Dennison Manufacturing**  
139 Newbury St.  
Framingham, MA 01701  
*Circle 340*

**Design 100 Corp.**  
540 Oppen St.  
P.O. Box 578  
Escondido, CA 92025  
*Circle 341*

**Diablo**  
24500 Industrial Blvd.  
Hayward, CA 94545  
Diablo 1640  
HiType II  
*Circle 342*

**Diamond Engineering**  
3635 150th NE  
Redmond, WA 98052  
*Circle 343*



- Di-An Controls, Inc.**  
944 Dorchester Ave.  
Boston, MA 02125  
Di-An 60, Di-An 120  
*Circle 165*
- Digiclocks**  
3016 Ocean View  
Orange, CA 92665  
Microprinter 100  
*Circle 166*
- Digital Associates Corp.**  
1039 East Main St.  
Stamford, CT 06902  
*Circle 167*
- DIP, Inc.**  
121 Beach St.  
Boston, MA 02111  
DIP-80  
*Circle 70*
- DMC, Div. of Cetec Corp.**  
2300 Owen St.  
Santa Clara, CA 95051  
*Circle 71*
- Documentation, Inc.**  
150 Wickham Rd.  
Melbourne, FL 32901  
*Circle 72*
- Dytec/Central**  
315 W. University Dr.  
Arlington Heights, IL 60004  
*Circle 73*
- Electronic Products Assoc.**  
1157 Vega St.  
San Diego, CA 92110  
*Circle 74*
- Excel Company**  
Micro Computer Systems  
618 Grand Ave.  
Oakland, CA 94610  
*Circle 76*
- Expandor Inc.**  
400 St. Clair Plaza  
Pittsburgh, PA 15241  
*Circle 77*
- Extel Corp.**  
3005 MacArthur Blvd.  
Northbrook, IL 60062  
AH/P-11R  
*Circle 78*
- Facit, Inc.**  
66 Field Point Rd.  
Greenwich, CT 06830  
*Circle 79*
- Florida Data Corp.**  
3308 New Haven Ave.  
W. Melbourne, FL 32901  
FDC 600A, 600C  
*Circle 80*
- Futra Company**  
P.O. Box 4380  
Torrance, CA 90510  
Spinwriter, IDS  
*Circle 81*
- General Electric Corp.**  
GE Drive  
Waynesboro, VA 22980  
Terminet 200, 340, 510  
*Circle 82*
- Genesis One Computer Corp.**  
300 E. 44th St.  
New York, NY 10017  
*Circle 83*
- Gould Inc.**  
3631 Perkins Ave.  
Cleveland, OH 44114  
*Circle 84*
- Harris Corp.**  
Data Communications Div.  
16001 Dallas Pkwy.  
Dallas, TX 75240  
*Circle 85*
- Heath Data Systems**  
Hilltop Road  
St. Joseph, MI 49085  
Heath WH-14, WH-24, WH-44  
*Circle 96*
- Hecon Corp.**  
31-45 Park Rd.  
Tinton Falls, NJ 07724  
*Circle 97*
- Hetra**  
1151 S. Eddie Allen Rd.  
P.O. Box 970  
Melbourne, FL 32901  
*Circle 86*
- Hewlett Packard Co.**  
1507 Page Mill Rd.  
Palo Alto, CA 94304  
*Circle 87*
- Hobbyworld Electronics**  
19511 Business Center Dr.  
Northridge, CA 91324  
Centronics  
*Circle 192*
- Houston Instruments**  
8500 Cameron Rd.  
Austin, TX 78753  
*Circle 88*
- Hycom Inc.**  
16841 Armstrong Ave.  
Irvine, CA 92795  
*Circle 89*
- Inforex**  
21 North Ave.  
Burlington, MA 01803  
*Circle 90*
- Input Output Unlimited**  
5922 Kester Ave.  
Van Nuys, CA 91411  
Spinterm  
*Circle 91*
- Integral Business Systems**  
325 E. 48th St.  
New York, NY 10017  
Diablo 1640, IDS 440,  
Centronics, Axiom Ex-801-P,  
Microtek MT-80P, Comprint  
912P  
*Circle 92*
- Integral Data Systems**  
14 Tech Circle  
Natick, MA 01760  
IDS 440  
*Circle 93*
- Interface Systems Inc.**  
462 Jackson Plaza  
Ann Arbor, MI 48103  
*Circle 94*
- Intertec Data Systems**  
2300 Broad River Rd.  
Columbia, SC 29210  
*Circle 95*
- Itel Corp.**  
One Embarcadero Center  
San Francisco, CA 94111  
*Circle 202*
- Jade Computer Products**  
4901 W. Rosecrans  
Hawthorne, CA 90250  
IDS  
*Circle 204*
- Kontron Electronic Inc.**  
700 South Claremont St.  
San Mateo, CA 94402  
*Circle 206*
- Landis & Gyr Inc.**  
4 Westchester Plaza  
Elmsford, NY 10523  
*Circle 207*
- Lear Siegler Inc.**  
Data Products Division  
714 North Brookhurst St.  
Anaheim, CA 92803  
*Circle 208*
- Litton Datalog**  
1770 Walt Whitman Rd.  
Melville, NY 11746  
*Circle 209*
- Local Data**  
2701 Toledo St.  
Torrance, CA 90503  
Quiet 300, FA80, 132  
*Circle 210*
- LogAbax**  
10889 Wilshire Blvd.  
Los Angeles, CA 90024  
*Circle 211*
- Logicon/Intercomp**  
24225 Garnier St.  
Long Beach, CA 90505  
*Circle 212*
- Lords Corp.**  
P.O. Box 99  
Port Angeles, WA 98362  
Superbrain Emako 22  
*Circle 314*
- LRC Inc.**  
Technical Industrial Park  
Riverton, WY 82501  
*Circle 213*
- Macro Products**  
3110 Willow St.  
Long Beach, CA 90806  
*Circle 214*
- Malibu Electronics Corp.**  
2301 Townsgate Rd.  
Westlake Village, CA 91361  
Malibu 165  
*Circle 215*
- Matchless Systems**  
Dept. 3  
18444 South Broadway  
Gardena, CA 90248  
MS-204  
*Circle 216*
- Media III**  
2259 Via Burton  
Anaheim, CA 92806  
*Circle 217*
- Memorex Corp.**  
3015 Daimler St.  
Santa Ana, CA 92705  
*Circle 218*
- Mesa Inc.**  
11900 Park Lawn Dr.  
Rockville, MD 20852  
*Circle 219*
- MFE**  
Keewaydin Dr.  
Salem, NH 03079  
*Circle 220*
- Micro-Computer Devices**  
3156 East LaPalma Ave.  
Dept. H.  
Anaheim, CA 92806  
*Circle 221*
- Microcomputer Technology**  
2080 South Grand Ave.  
Santa Ana, CA 92705  
Centronics  
*Circle 222*
- Microdata Corp.**  
17481 Red Hill Ave.  
Irvine, CA 92750  
*Circle 223*
- Micromail**  
Box 3297  
Santa Ana, CA 92703  
Diablo, TI810  
*Circle 224*
- Microtek Inc.**  
9514 Chesapeake Drive  
San Diego, CA 92123  
MT-80  
*Circle 225*
- Micro World**  
1425 W. 12th Pl.  
Tempe, AZ 85281  
TI 810  
*Circle 226*
- Micro World Computer Store Inc.**  
435 Main St.  
Johnson City, NY 13790  
Model 43 TTY  
*Circle 227*
- Mid East Micro**  
P.O. Box 621  
Bristol, IN 46507  
Comprint, Heath, Centronics,  
TI  
*Circle 228*
- Midwest Computer Peripherals**  
P.O. Box 437  
Wilmette, IL 60091  
Centronics, IDS, TI  
*Circle 229*
- Miltope Corp.**  
9 Fairchild Ave.  
Plainview, NY 11803  
*Circle 230*
- Mini-Computer Systems**  
399 Fairview Park Dr.  
Elmsford, NY 10523  
*Circle 231*
- Mohawk Data Sciences Corp.**  
1599 Littleton Rd.  
Parsippany, NJ 07054  
*Circle 232*
- Moxon Inc.**  
2222 Michelson Dr.  
Irvine, CA 92715  
*Circle 233*
- MPI**  
2099 West 2200 South  
Salt Lake City, UT 84119  
Model 88T  
*Circle 234*
- Multi-Business Computer**  
28 Marlborough St.  
Portland, CT 06480  
TI, Centronics, Pet  
*Circle 235*
- NCE/Compumart Inc.**  
270 Third St.  
Cambridge, MA 02142  
Pet 2027, IDS 440,  
Centronics 730-1, Spinwriter  
5510/5515  
*Circle 236*
- NCR Corp.**  
Main & K. Sts.  
Bldg. #26  
Dayton, OH 45479  
*Circle 237*
- NEC Information Systems**  
5 Militia Dr.  
Lexington, MA 02178  
*Circle 238*
- New England Electronics**  
679 Highland Ave.  
Needham, MA 02194  
Pet, NEC  
*Circle 239*
- Okidata Corp.**  
111 Gaither Dr.  
Mt. Laurel, NJ 08054  
Microline 80  
*Circle 241*
- Olenksy Bros., Inc.**  
Computer Sales Div.  
3763 Airport Blvd.  
Mobile, AL 36608  
Centronics  
*Circle 240*



Olivetti Corp. of America  
500 Park Ave.  
New York, NY 10022  
Circle 242

Owens Associates, Inc.  
12 Schubert St.  
Staten Island, NY 10305  
TTY 43  
Circle 243

Panasonic Elec. Component  
P.O. Box 1503  
Secaucus, NJ 07094  
Circle 244

Perkin Elmer Terminals  
360 Route 206 South  
Flanders, NJ 07836  
Pussycat 650  
Circle 245

Potter Instruments Co., Inc.  
36 Cain Dr.  
Plainview, NY 11803  
Circle 246

Practical Automation  
Trap Falls Rd.  
Shelton, CT 06484  
Circle 247

The Printec Co.  
8 Gill St.  
Woburn, MA 01801  
Circle 248

Printer Terminals  
Communications Corp.  
124 Tenth St.  
Ramona, CA 92065  
Printer 877, 879  
Circle 249

Printronic, Inc.  
17421 Derian Ave.  
P.O. Box 19559  
Irvine, CA  
Circle 250

Priority One  
Electronics  
16723K  
Roscoe Rd.  
Sepulveda, CA 91343  
Centronics  
Circle 251

Qualterm Terminals  
238 Caribbean Dr.  
Sunnyvale, CA 94086  
Circle 252

Quasar Data Products  
25151 Mitchell Dr.  
North Olmsted, OH 44070  
TI, IDS  
Circle 253

Qume  
2350 Qume Dr.  
San Jose, CA 95131  
Sprint 5, Sprint Micro 3  
Circle 254

Radio Shack  
700 One Tandy Center  
Fort Worth, TX 76102  
Circle 256

Randal Data Systems  
2807 F. Oregon Ct.  
Torrance, CA 90503  
Circle 255

RCA Service Co./Data  
Services  
Div. of RCA Corp.  
Rte. 38, Bldg. 204-2  
Cherry Hill, NJ 08358  
Teletype 33 ASR, 43KSR,  
RO  
Circle 257

Redactron Corp.  
95 Horseblock Rd.  
Yaphank, NY 11980  
Circle 258

Rondure Company  
2522 Butler St.  
Dallas, TX 75235  
Terminet 300  
Circle 259

Sanders Technology, Inc.  
P.O. Box 1226  
Nashua, NH 03061  
Sanders 12/7  
Circle 260

Sara Tech Computers  
P.O. Box 692  
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# Simulating Special Function Keys

BY WILLIAM KLUNGLE

Techniques presented in this article will let you simulate Special Function Keys, a feature found on many minicomputers and some micros but not found on the TRS-80 Model I.

What are Special Function Keys? Well, on the Hewlett Packard 250 and the HP 85, the primary Special Function Keys (SFKs) are located along the bottom edge of the display screen. At first these keys might seem like a bit of a gimmick, but I caution you not to make any hasty judgments regarding their usefulness.

SFKs are programmed by using two statements: ON KEY and OFF KEY. ON KEY allows you to designate the key number to be used, provide an identifying title to print over the key and specify the line number to which the program will branch in the event the key is pressed. When the ON KEY statement is executed in a program, the key identifier is printed over the proper key and the SFK is activated. The OFF KEY statement simply cancels all active keys and removes the key labels from the display screen.

Special Function Keys can replace the old tried-and-true menu selection commonly used to make program decisions. The keys are however, a great deal more powerful than just that! After the keys have been activated, the program can continue execution until an SFK is pressed, at which time the program will immediately branch to the line designated in the ON KEY statement associated with that key number. SFKs not only provide a whole new set of programming possibilities, but when properly used, they establish a friendly environment for the computer operator. Using Special Function Keys is a less

intimidating way for a non-computer person to interact with the machine.

Even within the limitations of a small home computer system such as the TRS-80, you can closely simulate most of the functions of the SFKs. Although

the SFKs programmed on my TRS-80 do not provide the priority branch capabilities, they do provide a friendly yet versatile decision making method which any operator can readily understand. The TRS-80 SFKs provide an-

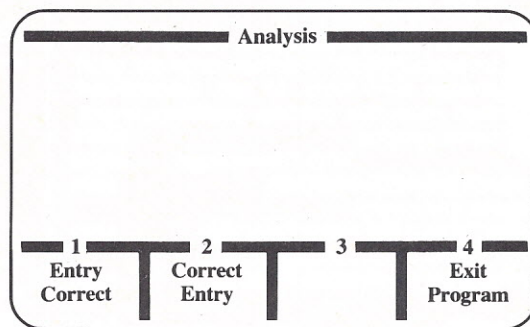


Figure 1 Simulated display output of routine in use.

Figure 2

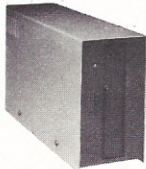
```
90000 FOR I = 16192 TO 16255: POKE I,131: NEXT I: FOR I = 16205 TO 16255
STEP 17: POKE I,171: POKE I+64,170: POKE I+128,170: NEXT I: P=49:
FOR I = 16198 TO 16255 STEP 16: POKE I-1,129: POKE I,P: POKE I+1,130:
P=P+1: NEXT I
90005 N=1: FOR I = 899 TO 959 STEP 16: PRINT @I,A$(N);: N=N+1: NEXT I:
FOR I = 963 TO 1023 STEP 16: PRINT @I,A$(N);: N=N+1: NEXT I
90010 X$=INKEY$: IF X$ < CHR$(49) OR X$ > CHR$(52) THEN 90010 ELSE X=VAL(X$):
RETURN
```

Figure 3

```
1000 A$(1)=" ENTRY " : A$(5)="CORRECT " : A$(2)=" ENTRY " : A$(6)=" ERROR " :
A$(3)=" " : A$(7)=" " : A$(4)=" EXIT " : A$(8)="PROGRAM " :
GOSUB 90000: ON X GOTO 150, 50, 100, 900
```



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other benefit because they permit you to "lock-out" all keyboard entries except those which are allowable, thus providing error free entries.

The three-line subroutine shown in Figure 2 provides the SFK feature for a Level II TRS-80. Line 9000 uses the POKE statement to display the four graphic boxes representing the four Special Function Keys. The variable "P" is used to provide the ASCII code of the desired block/key identifiers to the following POKE command. In the example, the numbers 1 through 4 (ASCII 49 to 52) identify the blocks as keys numbered one through four.

Line 9005 prints the identifying label in the graphic blocks. The block labels are stored in string array A\$. There is space for eight characters in each block width; two lines may be used in each block.

Elements of array A\$ must be supplied or modified by the program before the SFK routine is called. This allows you either to retain previous labels, modify the labels or delete the labels as needed. It's a good idea to use a full eight spaces to modify or delete any of the array elements as this ensures that previous labels will be removed if the routine is called to overwrite the blocks.

Line 9010 holds the program in a closed loop until an allowable key is pressed. In Figure 2, any keyboard entry

**SFKs can replace the old  
tried-and-true menu commonly  
used to make program decisions.**

(including *no* entry) other than keys one, two, three or four sends the program back to line 9010. The exception is, of course, the Break key which still terminates the program.

When an acceptable key is pressed, variable X is set to the numeric value of X\$ and the program returns to the calling point. You now have both X and X\$ to use either in a conditional test or perhaps in an On/Goto statement to branch the program in accord with the key entry.

In using this subroutine, I've found it most effective to use a separate program line to set the label array, call the subroutine, and test the results. As shown in Figure 3, using a single line will make it easy to send "empty block" entries back to the input request, ensuring that the operator can only use active SFKs.

Obviously, it would be easier for a programmer to use the menu method with a standard INPUT statement rather than go to the trouble of setting up Special Function Keys. But SFKs do offer advantages to both programmer and operator over the standard method. SFKs are much friendlier to a non-skilled operator and they provide a novel, less intimidating way of requesting operator participation. If you've ever tried to demonstrate one of your programs to a layman friend, only to have the effect spoiled with continual injections of " . . . PRESS THE ENTER KEY . . . YES, THE WHITE ONE", I'm sure you can appreciate the Special Function Key concept. As an added benefit, the SFKs allow you to control entry mistakes, helping to eliminate the format-spoiling ?REDO from appearing in the middle of your display.

Special Function Keys are *in* for the 1980s. Hewlett Packard led the way with SFKs on their HP 250, HP 300 and HP 85 computers. Other manufacturers are also providing versions of Special Function Keys and Radio Shack has included two programmable keys on the new TRS-80 Model II. Upgrade *your* system into the future: Use Special Function Keys in your next program. □



# COMPUTER CHESS

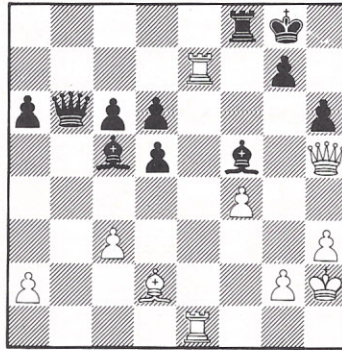
HARRY SHERSHOW — Dept. Editor  
MORRIS MILLER — Chess Annotator

## The Best of Chess

On Nov. 27, 1899, a remarkable game occurred at the Boylston Chess Club, Boston, Mass. It was remarkable for two reasons. First, it is now considered the best game ever recorded at the chess club in its nearly 100 years of existence. Second, after Black's 31st move, John T. Barry, playing White, announced mate in 13 moves! His opponent, Henry Pillsbury, also listed among the world's great chess players at that time, conceded the game. Official documentation of that game was lost in time. On March 16, 1914, however, at the Boylston chess club, John Barry, at the invitation of the chess club, sat down at a board and, from memory alone, reconstructed the game that had been played 15 years earlier, including the point at which Barry announced mate in exactly 13 moves!

WHITE — John T. Barry  
BLACK — Henry Pillsbury

- |                                                 |           |
|-------------------------------------------------|-----------|
| 1. e2-e4                                        | e7-e5     |
| 2. N-f3                                         | N-c6      |
| 3. B-b5                                         | N-f6 (A)  |
| 4. d2-d4                                        | Nxe4      |
| 5. d4-d5                                        | N-d6      |
| 6. N-c3 (B)                                     | e5-e4     |
| 7. N-g5                                         | N-e5      |
| 8. Q-d4                                         | f7-f6     |
| 9. Ng5xe4                                       | NxB       |
| 10. NxN                                         | a7-a6 (C) |
| 11. Q-a4 R-b8; 12. N-d4 B-e7; 13. Q-b3 d7-d6;   |           |
| 14. f2-f4 N-g4(D); 15. 0-0 f6-f5; 16. N-g3 0-0; |           |
| 17. N-c6(E) PxN; 18. QxR PxP; 19. Q-b3 c7-c6;   |           |
| 20. B-d2 Q-c7; 21. R/a-e1 B-f6; 22. h2-h3(F)    |           |
| B-d4+; 23. K-h1 N-f2+; 24. K-h2 N-e4;           |           |
| 25. NxN P/f5xN 26. RxP BxPb2; 27. P-c3          |           |
| B-a3; 28. R/f-e1 B-f5; 29. R-e7 Q-b5; 30.       |           |
| Q-d1(G) B-c5; 31. Q-h5 h7-h6; 32. (At this      |           |
| point, Barry announces mate in exactly 13 moves |           |
| and Pillsbury concedes (H). The moves which led |           |
| to mate:)                                       |           |
| 32. RxP+                                        | KxR       |
| 33. R-e7+                                       | K-g8      |
| 34. QxP                                         | B-g1+     |
| 35. K-h1                                        | B-d4      |
| 36. PxB                                         | QxP       |
| 37. Q-g5+                                       | K-h8      |
| 38. Q-h4+                                       | K-g8      |
| 39. Q-g3+                                       | K-h8      |
| 40. B-c3                                        | QxB       |
| 41. QxQ+                                        | d5-d4     |
| 42. QxP+                                        | R-f6      |
| 43. QxR+                                        | K-g8      |
| 44. Q-g7 mate                                   |           |



Position at end of 31st move. White to play and win. (At this point, White announced a mate in 13 moves!) Game played at Boylston Chess Club, Boston on Nov. 27, 1899 and reconstructed from memory by Barry 15 years later.

Barry's feat in reconstructing this brilliant game from memory 15 years after its occurrence prompted officials of the chess club to draw up an official attestation which hangs proudly, today, on the walls of the Boylston Chess Club. Despite the aging yellow appearance of the parchment it shines brightly as a highlight in the long history of chess.

In discussing this feat recently with members of the Boylston Chess Club, some of them questioned whether

modern-day computers with their whiz-bang memories and blistering speed could duplicate Barry's feat. We agreed to submit the problem to a few of the computers without revealing the number of moves to mate (and hoping they would not recognize the classic problem). Following are some of the responses received.

Most remarkable of all the replies was the one from Commodore whose CHESSMATE device was expected to show up on the market alongside BORIS and CHESS CHALLENGER, but which so far has made no appearance. Bill Seiler, project engineer for Commodore writes: "I set CHESSMATE's board for the 31st move. In the first six games, black was played by a human. In game #7 CHESSMATE played itself. In the first five games, CHESSMATE forced a mate. In game #7 (CHESSMATE vs. CHESSMATE) CHESSMATE as white forced a quick mate. I hope these examples will show CHESSMATE's skill of play."

Ken Thompson of the BELLE program, which won the 10th ACM North American computer-chess title, gave the game a whirl on his hardware at the Bell Telephone Labs in NJ:

"I tried the Boylston chess problem

### Notes to Barry/Pillsbury

PC's Chess Annotator, Morris Miller, analyzes the famous game in his following comments:

- A) An old fashioned defense, rarely seen nowadays.
- B) If now 6 . . . NxB; 7. NxN N-e7?; 8. d5-d6! etc.
- C) Black should play, instead, d7-d6.
- D) Obviously afraid of 14. . . . N-g6; 15. f4-f5 and a knight in at e6
- E) This move was "on" for some time; black simply could not neglect his development. He gets an important center pawn for the resulting exchange.
- F) He could have driven the knight away, but wants to give black enough rope.
- G) To swing over to the king side.
- H) This type of position is typical. There are books written on the king hunt in chess. When will such ideas be programmed into computers?



on my computer. I let it go for 460 minutes with a search of 8 ply deep (checks didn't count) looking at 72 million positions. To see the mate from the initial position would take an estimated 70 years. It would play the variation after a mere year of computing because it would see material compensation. When I forced the initial move (R:g7+) it then played out the whole mate letter perfect. Except for the second move, Re7+, which took 40 seconds to find, it played each move in less than a second. The first time that it really saw the mate in reasonable time (less than a minute) was on move 40.

"I looked up the game in Horowitz's Golden Treasury of Chess (Barnes & Noble 1961). The game score supplied by Boylston differs from Horowitz at white's 15th and 16th moves and at black's 14th and 15th moves. Boylston's score also has ambiguities at white's 21st and 28th moves."

(Moves of this game were taken from an officially-attested reconstruction of the game as previously described. Ambiguities arose probably because of the inherent difficulty in reading the hand-written English Script Lettering, with its old grand flourishes and its scrolled embellishments. -ed.)

The solution that finally appeared on Ken's printer agreed perfectly with the

actual moves. "However," adds Ken, "this problem is an unreasonable test for a computer. There are better test programs in Tony Marsland's positions from games played at a New York 1924 tournament. He is professor of Computer Science at the University of Edmonton, Canada." Ken's comments on CHESSMATE's solutions which had been submitted to him for analysis:

"Commodore CHESSMATE's solutions are really horrible games. They look more like 'help mates' than real play. As an example:

| Game #3 | Chessmate | Bill Seiler |
|---------|-----------|-------------|
| 32.     | Re8 (a)   | Bd7         |
| 33.     | Rf8+      | K:f8        |
| 34.     | h4(b)     | Qb2(c)      |
| 35.     | Rc1(d)    | Q:c3        |
| 36.     | Qe2       | Bg4(e)      |
| 37.     | Qe8++     |             |

"a) Forces exchanges — afterward it's probably a draw. b) Totally pointless. c) Wins a pawn. d) Pointless — attacks the Q which is going to capture a pawn anyway. e) A helpmate move. VERY bad.

"The depth of analysis of Chessmate is probably apparent from the following:

| Game #7 | Chessmate | Chessmate |
|---------|-----------|-----------|
| 32.     | Re8       | Bh7(a)    |
| 33.     | R:f8+ (b) | K:f8      |
| 34.     | Re8++     |           |

"a) Another helpmate move. This is the

ONLY move that allows a forced mate. It takes an exhaustive search program less than 1000 positions examined to avoid this mate and play 32. . . . Bd7. b) It takes less than 300 positions examined to find this mate in 2. Of course it isn't known whether CHESSMATE saw the mate or just attacked the K as it attacked the Q in the previous game.

"Giving CHESSMATE the benefit of the doubt, we can assume that the number of positions examined is between 300 and 1000 per play. If we plug in these search depths into the empirical rating formula  $R = 400 * (N^{1/8})$ , then we come up with CHESSMATE's rating at between 815 and 950! In short, Barry's move still stands as truly masterful."

Bob Hyatt, of the University of Southern Mississippi and operator of the strong BLITZ program sent the following thoughts on the Barry-Pillsbury game:

"There is currently no computer chess program in existence that can find such a mate unless you consider programs that look only for mates and do not play complete games. A mate in 5 or 6 moves is about the limit for current programs except in certain rare positions where a deeper mate might be found. Giving BLITZ one hour on our university computer, BLITZ 'feels'

## Commodore offers seven "easy" solutions

| Game #1 | Chessmate (W) | Bill Seiler (B) |
|---------|---------------|-----------------|
| 31.     | d1-h5         | h7-h6           |
| 32.     | e7-e8         | g7-g6           |
| 33.     | h5-h6         | b6-c7           |
| 34.     | e8-f8 (mate)  |                 |

| Game #2 | Chessmate (W) | Bill Seiler (B) |
|---------|---------------|-----------------|
| 31.     | d1-h5         | h7-h6           |
| 32.     | e7-e8         | b6-b2           |
| 33.     | e8-f8 (check) | g8-f8           |
| 34.     | e1-e8 (mate)  |                 |

| Game #3 | Chessmate (W) | Bill Seiler (B) |
|---------|---------------|-----------------|
| 31.     | d1-h5         | h7-h6           |
| 32.     | e7-e8         | f5-d7           |
| 33.     | e8-f8 (check) | g8-f8           |
| 34.     | h3-h4         | b6-b2           |
| 35.     | d2-c1         | b2-c3           |
| 36.     | h5-e2         | d7-g4           |
| 37.     | e2-e8 (mate)  |                 |

| Game #4 | Chessmate (W) | Bill Seiler (B) |
|---------|---------------|-----------------|
| 31.     | d1-h5         | h7-h6           |
| 32.     | e7-e8         | f5-d7           |
| 33.     | e8-f8 (check) | g8-f8           |
| 34.     | h3-h4         | b6-d8           |

|     |               |       |
|-----|---------------|-------|
| 35. | e1-e2         | d7-e8 |
| 36. | h5-f5 (check) | d8-f6 |
| 37. | f5-h3         | e8-h5 |
| 38. | h3-c8 (check) | f8-f7 |
| 39. | c8-e8 (mate)  |       |

| Game #5 | Chessmate (W) | Bill Seiler (B) |
|---------|---------------|-----------------|
| 31.     | d1-h5         | h7-h6           |
| 32.     | e7-e8         | c5-g1 (check)   |
| 33.     | e1-g1         | b6-f2           |
| 34.     | e8-f8 (check) | g8-f8           |
| 35.     | h5-f5 (check) | f8-e7           |
| 36.     | g1-e1 (check) | f2-e1           |
| 37.     | d2-e1         | d5-d4           |
| 38.     | c3-d4         | d6-d5           |
| 39.     | e1-b4 (check) | e7-d8           |
| 40.     | f5-f8 (check) | d8-c7           |
| 41.     | f8-g7 (check) | c7-b6           |
| 42.     | g7-h6         | b6-b5           |
| 43.     | a2-a3         | b5-c4           |
| 44.     | h6-c6 (check) | c4-d4           |
| 45.     | c6-a6         | d4-e4           |
| 46.     | h2-g3         | d5-d4           |
| 47.     | a6-b7 (check) | e4-e3           |
| 48.     | b7-f3 (mate)  |                 |

(Chessmate Loses)

| Game #6 | Chessmate (W) | "Mitch"(B)    |
|---------|---------------|---------------|
| 31.     | d1-h5         | h7-h6         |
| 32.     | e7-e8         | f5-d7         |
| 33.     | e8-f8 (check) | g8-f8         |
| 34.     | h3-h4         | b6-d8         |
| 35.     | e1-e2         | d8-c8         |
| 36.     | g2-g3         | d7-g4         |
| 37.     | e2-e8 (check) | c8-e8         |
| 38.     | h5-g4         | h6-h5         |
| 39.     | g4-f5 (check) | f8-g8         |
| 40.     | f5-d3         | a6-a5         |
| 41.     | a2-a4         | c5-b6         |
| 42.     | f4-f5         | e8-e5         |
| 43.     | d2-f4         | e5-e1         |
| 44.     | f4-d6         | e1-g1 (check) |
| 45.     | h2-h3         | g1-h1 (mate)  |

| Game #7 (Chessmate vs. Chessmate) | Chessmate (W) | Chessmate (B) |
|-----------------------------------|---------------|---------------|
| 31.                               | d1-h5         | h7-h6         |
| 32.                               | e7-e8         | f5-h7         |
| 33.                               | e8-f8 (check) | g8-f8         |
| 34.                               | e1-e8 (mate)  |               |



that the following variation is optimal: R-K8 B-K5 R×R+ K×R P×B5 K-N1. The evaluation is exactly even with neither side having an advantage.

"This example, however, is a poor one for computer testing. By the way, BLITZ examined 183,740 nodes and evaluated 125,269 positions to reach the preceding analysis so the position is not simple. R×P+ would take many, many hours to find and I am not sure there is a forced mate. The king seems to get out through N4, B5 where there are no more checks available."

"Dave Cahlander of Control Data took a crack at the problem. Dave, who is majordomo of World Champion Chess 4.9 running on CDC 176 had the following comments:

"Enclosed are the results of running the Barry-Pillsbury position on CHES 4.7. The mate in 13 is much too deep for our program to find using the techniques that it does. An approximation of the amount of time required to find this solution is seven years, based on the fact that it took 1054 seconds to do a 10-ply search and that a 21-ply search is

required to find the checkmate (actually a 25-ply search is required but the program extends checking sequences up to 4-ply). The amount of time spent on each step in the search sequence was determined by me, watching the machine's anticipated move. After a short period of time, if the machine chose the correct move, I told it to accept the move. If the move was not correct, I let it continue to search deeper and deeper until it found the correct move. With this technique the correct sequence of moves was found with the exception that 2... Kg7-f6 was found instead of 2... Kg7-g8. This inferior move for black caused a mate in 9. To run the rest of the problem, the correct move was forced and the machine was allowed to continue."

KAISSA in Russia tried the problem also, as Professor M.V. Donskoy informed us in a recent letter. He also discussed the early computer chess match (1967) of Moscow and U.S.

"When the match between Moscow and Stanford programs was being played" he recalled, "I was a student

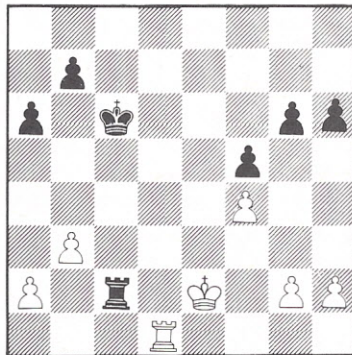
and took no part in programming the ITEP chess program — the predecessor of KAISSA. ITEP won the match three games to one. A.V. Uskov was an active member of the team then and still spends part of his time on KAISSA. The moves of the match had been sent by wireless once a week and surprisingly there had been no errors during communication such as occasionally occur these days. Before the Stanford game, ITEP had played two games with 3-ply search and two with 5-ply search. The two former were drawn and the two latter longer searches were won by ITEP. It took about 10 minutes to carry out a 3-ply search and about 2 hours for a 5-ply one. The moves, coded by humans, had been entered through the computer panel.

"KAISSA tried the positions of the Barry-Pillsbury game. With normal time limits (about 5 minutes of CPU for IBM 370/168) the program failed to find the best move and played B-K3. Half of the time was spent for the search of R\*P during which KAISSA twice reached a maximum depth of 30 plies!"

## From Russia With Games

The following note was received from Prof. M.V. Donskoy, of the Institute for Systems Studies, 29 Ryleev St., Moscow, 119034 USSR: "I would like to let you know that KAISSA is now playing in official human tournaments in Russia. The opponents, at the moment, are children about 11 years old who are playing members of the Moscow Pioneer Palace's Chess Club. They are pretty strong players. The Palace's great reputation comes from the fact that all Moscow's grandmasters began their playing careers at this club. In these official human tournaments, KAISSA has, so far, won seven games, and drawn two. One game was adjourned due to operator's failure. Following is a documentation of the two drawn games. You will notice that up to the 13th move of the Sergei game, both opponents have played along opening-book lines. A very complex position arose by the 28th black move and presented KAISSA with a difficult prob-

lem. KAISSA was not able to solve the problem and the game with Sergei was declared a draw after the time control had been reached. The final position can be played to a win. However, none of today's chess programs can win that endgame. Time limit used was 40 moves in 1-1/2 hours.



Position after Black's 40th move

WHITE — KAISSA  
BLACK — Jilinsky Anton

- |             |         |
|-------------|---------|
| 1. e2-e4    | e7-e5   |
| 2. Ng1-f3   | Nb8-c6  |
| 3. Bf1-b5   | d7-d6   |
| 4. d2-d4    | Bc8-d7  |
| 5. Nb1-c3   | e5:d4   |
| 6. Nf3:d4   | Nc6:d4  |
| 7. Qd1:d4   | Bd7:b5  |
| 8. Nc3:b5   | Ng8-f6  |
| 9. Qd4-a4   | Qd8-d7  |
| 10. Nb5:c7+ | Ke8-d8  |
| 11. Qa4:d7  | Nf6:d7  |
| 12. Nc7:a8  | Kd8-c8  |
| 13. Bc1-f4  | Kc8-b8  |
| 14. e4-e5   | Nd7:e5  |
| 15. Bf4:e5  | d6:e5   |
| 16. Ra1-d1  | Bf8-b4  |
| 17. c2-c3   | Bb4-a5  |
| 18. Rd1-d5  | Ba5-d8  |
| 19. Rd5:e5  | Kb8:a8  |
| 20. O-O     | a7-a6   |
| 21. Rf1-d1  | Bd8-f6  |
| 22. Re5-e1  | h7-h6   |
| 23. Rd1-d7  | Rh8-f8  |
| 24. f2-f4   | Bf6-d8  |
| 25. Kgl-f2  | Ka8-a7  |
| 26. c3-c4   | Ka7-b6  |
| 27. Re1-e3  | Kb6-c6  |
| 28. Re3-d3  | Bd8-b6+ |
| 29. Kf2-f3  | Bb6-c5  |
| 30. Kf3-e4  | g7-g6   |
| 31. Rd3-d1  | Rf8-e8+ |
| 32. Ke4-f3  | Re8-e3+ |
| 33. Kf3-g4  | f7-f5+  |
| 34. Kg4-h4  | Bc5-e7+ |
| 35. Rd7:e7  | Re3:e7  |
| 36. Kh4-g3  | Re7-e3  |
| 37. Kg3-f2  | Re3-e4  |
| 38. Kf2-f3  | Re4:c4  |
| 39. b2-b3   | Rc4-c3+ |
| 40. Kf3-e2  | Rc3-c2+ |
| 41. Rd1-d2  | Re2:d2  |
| 42. Kc2:d2  | b7-b6   |
| 43. Kd2-d3  | Kc6-d5  |
| 44. a2-a3   | b6-b5   |



|            |        |
|------------|--------|
| 45. g2-g3  | a6-a5  |
| 46. a3-a4  | b5-a4  |
| 47. b3:a4  | h6-h5  |
| 48. h2-h3  | Kd5-c5 |
| 49. Kd3-c3 | Kc5-d5 |
| 50. Kc3-d3 | Kd5-c5 |

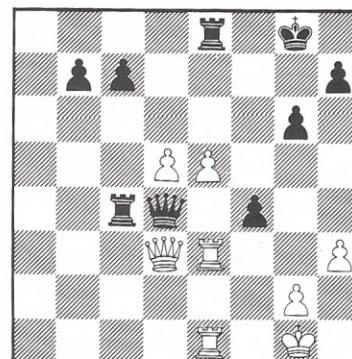
Draw

**WHITE — Opoitzev Sergei**  
**BLACK — KAISSA**

|              |            |
|--------------|------------|
| 1. e2-e4     | d7-d5      |
| 2. e4:d5     | Ng8-f6     |
| 3. d2-d4 (A) | Nf6:d5     |
| 4. c2-c4     | Nd5-b6 (B) |
| 5. Nb1-c3    | g7-g6      |
| 6. Bc1-e3    | Bf8-g7     |
| 7. h2-h3 (C) | O-O        |
| 8. Ng1-f3    | Nb8-c6     |
| 9. Bf1-e2    | e7-e5      |

10. d4-d5                      Nc6-e7  
11. O-O Ne7-f5 12. B e3-c5 (D) Rf8-e8 13.  
Ra1-c1 e5-e4 14. Nf3-d4 Qd8-g5 15. Bc5:b6  
a7:b6 16. Nd4:f5 Bc8:f5 17. Be2-g4 Bg7:c3 18.  
Rc1:c3 Ra8:a2 19. Bg4:f5 Qg5:f5 20. Qd1-b1  
Ra2-a5 21. Rf1-e1 Qf5-f4 22. Rc3-e3 f7-f5 23.  
f2-f3 Ra5-c5 24. b2-b3 b6-b5 25. f3:e4 b5:c4 26.  
b3:c4 Re5:c4 27. e4-e5 Qf4-d4 28. Qb1-d3 f5-f4  
29. Qd3:d4 Rc4:d4 30. Re3-c3 Rd4:d5  
31. Rc3:c7 (E)                Re8:e5  
32. Re1:e5                    Rd5:e5  
33. Rc7:b7                    h7-h6  
34. Kg1-f2                    Re5-d5  
35. Kf2-f3                    g6-g5  
36. Kf3-e2                    Rd5-e5+  
37. Ke2-f3                    Re5-e3+  
38. Kf3-f2                    Re3-d3  
39. Rb7-a7                    Kg8-f8  
40. Ra7-b7                    Rd3-d6

## Draw



**Position after Black's 28th move.**

## Notes to game of Sergei vs KAISSA

By Morris Miller

A. Since the player of the white pieces is eleven years old it is not surprising that he does not know the line going back to the 1930's discovered by Botvinnik:

3. c2-c4 c7-c6; 4. Nb1-c3 c6:d5; 5. d2-d4 Nb8-c6;  
6. Bc1-g5 d5:c4; 7. d4-d5 Nc6-e5; 8. Qd1-d4 Ne5-d3+;  
9. Bf1:d3 c4:d3; 10. Ng1-f3! Bc8-f5; 11. 0-0 h7-h6;  
12. Bg5:f6 g7:f6; 13. Qd4-f4 Qd8-d7; 14. Nf3:d4 Bf5-g6;  
15. Nc3-b5 Ra8-c8; 16. Ral-c1 and Botwinnik won.

B. Preferable is 4-...Nd5-f6.

C. Unnecessarily afraid of the pin. 7. Ngl-f3 Bc8-g4;

8. Bf1-e2 Bg4:f3; 9. Be2:f3 Nb6:c4? 10. Q d1-a4+ and Oxn or 10. BxP wins.

D. Well played. White does not give up his active bishop. However, three moves later he unexpectedly does so.

E. With rooks on the board and black's extra pawn being on the same side as white's pawns, it is difficult to avoid the draw. The alternative is 31. . . b7-b5; 32. e5-e6, Rd5-d6; 33. Rc7-b7, etc.

Professor Donskoy notes that all the Moscow grandmasters came from this chess palace. We may be hearing of Sergei in the future.

## In response to responses

Dan Neumayer, Product Development Manager for Chafitz, has read some of the letters appearing in this column, and sends along the following responses:

"Al Gallia, a 1500-rated player, says he has been waiting for a micro chess computer which can play at his level. Mr. Gallia need wait no longer! SARGON 2.5 is the program he has been waiting for. I can refer Mr. Gallia to two bodies of evidence to support my statement. The first are the results of matching SARGON 2.5 against other micro chess programs; the second is the USCF rating which SARGON 2.5 will soon have.

*"Personal Computing* has reported the adventures of SARGON since 1978 when it captured first place at the first micro chess tournament at the West

Coast Computer Faire, through SARGON II's defeat of AWIT at the 1979 ACM tournament, its victory over the winner of Don Gerue's Micro-Masters Tournament and its recent London Blitz. And now I am receiving report after report, both from purchasers of our Modular Game System and from product reviewers for various publications that SARGON 2.5 not only plays much stronger chess than any other chess computer you can buy, he also defeats every chess program now available for home computers!

"The United States Chess Federation recently amended their rules to allow computers to enter human tournaments in order to get an official USCF rating. We have not yet played in enough rated events to earn a nonprovisional rating, but the results so far ver-

ify that SARGON 2.5 does indeed play strong Class C chess.

“Another recent letter complained that some of the fun had gone out of chess computers since randomized play which is now standard for micro chess computers and non-random, always-make-the-best-move play. Another helpful SARGON 2.5 feature is the RESTORE key which allows you to ‘take back’ up to three moves in order to try a different approach.

"I'm certain that your readers will find that the Chafitz Modular Game System with SARGON 2.5 has virtually all the features they are looking for plus the ability to play other games (Checkers and Las Vegas 21 will be the next available Modules) plus the ability to accept the even stronger SARGON 3 program, available in 1981."



## Postal Tourney News

The "First Annual North American Open Computer Postal Chess Tourney" is off and running in Philadelphia, under the watchful eye of Varn Fields. Programs can still be entered in the tournament (see Computer Chess Classified Section.) Varn's first report on the tournament:

"This type of chess tourney takes a great deal of time for proper and equal pairing of opponents and completion of tourney groups across the United States. We are now under way with two complete sections. We have received a number of replies to our ads and we have 12 official entries. I would like to extend our welcome to all present and future postalites to enter our Computer Chess Tourney by correspondence as often as desired with hopes that these types of events will help to advance the field of computer chess play."

Two playing sections have been set up so far in the tournament.

The first section (80C-1):

Rick Stein  
908 13th Ave.,  
South Minneapolis, MN  
(Playing **Voice Challenger — Level 9**) (Rating 960)

Doug Jeffers  
Apt. #4-R  
24 West 56th St.,  
New York, NY 10019  
(Playing **SARGON I on North Star Horizon — Level 5**) (Rating 900)

Dr. John L. Plummer  
4808 B Blue Bird Ct.,  
Raleigh, NC  
(Playing **CHESS CHALLENGER 10 — Level 6**) (Rating 900)

Gregory McCowin  
7934 Lowber Ave.,  
Philadelphia, PA 19150  
(Playing **CHESS CHALLENGER 3 — Level 3**) (Rating 840)

Games and standings of this tournament will be reported from time to time.

The second section (80C-2):

John Urwin  
1537 Argyle Court  
San Jose, CA 95132  
(Playing **MYCHESS on Cromemco Z-2D — Level 6**) (Rating 1200)

Paul J. Powell, Jr.,  
1609 Glenmore Drive  
Wilmington, DE 19804  
(Playing **CHESS HP III on Hewlett Packard — Level 1**) (Rating 1200)

Lloyd L. Lank  
8500 EBY  
Overland Park, KS 66212  
(Playing **CUBE 1.1 on Honeywell — Level 1**) (Rating 1195)

Rick Stein  
908 13th Ave.,  
South Minneapolis, MN 55404  
(Playing **BORIS/SARGON 2.5 — Level 6**) (Rating 1180)

## CHESS FEVER?

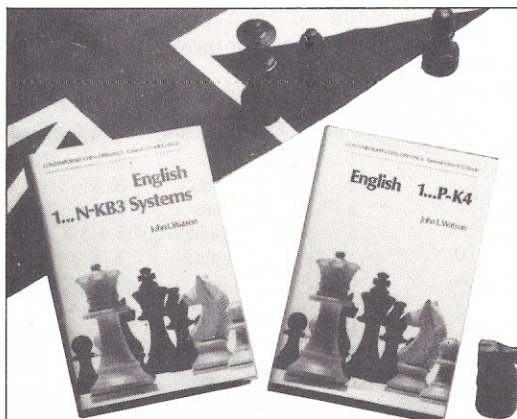


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CIRCLE 24



## The British Are Coming!

And the Russians, and the Americans, and the Yugoslavians, and everybody else who knows the devastating power of P-QB4, the so-called English Opening. The famous English master, Howard Staunton, popularized the opening during the London Tournament of 1851, and used it in his classic matches with St. Amant of France.

The wisdom behind the English is that White deliberately refrains from advancing a center pawn, partly in order to wait until Black's intentions are revealed.

Now, for the first time, there is available a comprehensive, definitive and practical study of the English Opening with all its subtleties and variations. American Master John Watson, after years of research and study, has just completed Volumes I and II of *The English Opening*. Written in an appealing, common sense manner, and using standard notation, these volumes are must reading for the serious player who wishes to enlarge his repertoire of effective openings.

These handsome, hardbound books are now available in the United States through The Troy Line. Volume I (P-K4) is \$19.95, and Volume II (N-KB3) is \$10.95. Save by purchasing the two-volume set at \$27.95.

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## THE TROY LINE

CIRCLE 26



# Chess Challenger's Voice Comes out of Both Sides of Its Mouth

By EVAN KATZ

After Fidelity Electronics created fabulous Chess Challenger Seven, the computer chess world expected the company's next machine to really be terrific. With promised added features it was to be more enjoyable and much stronger. However, the super-promoted Voice Challenger turned out to be somewhat of a disappointment. Considering the price and the exceptional strength of some of the other micro games and programs, one wonders exactly to whom Voice Challenger was talking.

As a game to be enjoyed, the Voice is much better than previous Fidelity games. The keys have been raised, and they click sharply to insure proper key-in. A new, hard, handsome plastic case with magnetic board and pieces make it a sturdy product which is easy on the eye and finger. The feature of the year, of course, is the mechanized human voice that calls out its moves, confirms yours, verifies the board position, and suggests a move for you on many levels. Even though some people consider the voice a "gimmick" or an annoyance, the majority of users reports that it adds much enjoyment to playing chess with a "computer." A good feature for those who get irritable when losing is that the voice can be silenced anytime during the game. The program itself occupies 8K ROM; the voice feature, 4K ROM; and 1K RAM is used for the tree search and variable storage. A fast 4.0 MHz Z-80A processor runs the program.

Voice Challenger could have been a great competitor in the opening. The machine's book is fantastic, composed of 1,274 moves spanning forty prominent opening lines. However, there are some openings which the computer should avoid for one side (e.g., black in the Center Counter), and some more solid ones which it should endeavor to develop more frequently. Overall, though, it's a welcome feeling to play different games each and every time, testing different parts of one's chess strategy knowledge.

But poor Voice Challenger is totally devoid of opening knowledge when on its own. After 1. e4 g6, the unenlightened game plays the super-ugly 2. Qf3 obviously unaware of the most basic of opening rules (not to expose the queen too early in the game without good reason). So, once out of its great book, there's nothing to guide it besides its middle-game strategy which is often inappropriate in the opening. While in the book, though, Voice "teaches" you all its book moves for a given position. This is surely a great benefit for the novice.

In the middle game, Voice Challenger is solid competition for a 1350 player. It sees a bit farther than the earlier seven-level Challenger but nowhere near as much as some other new games and programs in the same amount of time (see the look-ahead table, below, for moves 1-35).

Moves 1-35

| Level | Approx. Time  | Look-ahead    |
|-------|---------------|---------------|
| 1     | 5 seconds     | X             |
| 2     | 15 seconds    | X,X           |
| 3     | 35 seconds    | 5,4,X         |
| 4     | 1:20 minutes  | 5,4,2,X       |
| 5     | 2:20 minutes  | X,X,X         |
| 6     | 3 minutes     | 5,4,2,2,X     |
| 7     | 3:20 minutes  | X,X,X + extra |
| 8     | 6 minutes     | 5,4,2,2,X     |
| 9     | 11 minutes    | X,X,X,X       |
| H     | until stopped | X,X,X,X,X,X   |

In three minutes, Voice and its leading competitor both look ahead five ply, but the former only examines 2400 nodes (based on 30 moves/position) while the latter evaluates  $30^5$  or 24,300,00 positions, with better evaluation. Level 7 will go a bit deeper if necessary. Level H can be stopped anytime before it finishes a full six ply search (which takes about 1-1/2 hours. Other programs can do a similar search in less than 15 minutes.) Why do the Fidelity programmers insist on using a forward-pruned search when alphabets are being used now with much better results?

Because of its limited width, Voice misses good moves occasionally, both

for itself and the opponent. The game, on the full width levels (2,5,7,9,H), tells the player what ply number has been completed and suggests a move for the player based on what it saw when it made its own move. Both these features have now become fairly standard and are certainly of interest to the chess player and computer-chess nut. One thing that inhibits the Voice's potential is that it sits still and doesn't move a muscle on your time. At any time limit, most new programs now think on their opponents time. Why this was omitted is unknown.

Voice Challenger's midgame evaluation is fairly good and is well balanced in all its main chess aspects. The game has a fairly good knack for attack and defense. However, it's a bit weak, positionally, for today's breed of computer chess games. Slightly better than the Seven level, it should keep the average player going in this phase of the royal game. All the enjoyable features of the Seven are still implemented; such as, swapping sides, multiple move entry, problem set up, and changing sides in the middle of a battle. The player has to really attack the Voice to score and always has to watch out for his own King's safety.

Voice Challenger has a much improved endgame over its predecessor, although this has always been its weakest point. After move 35, the game expands the width of its thin search at the expense of depth or time (see the chart below).

Moves After 35

| Level | Approx. Time  | Look ahead    |
|-------|---------------|---------------|
| 1     | 5 seconds     | X             |
| 2     | 15 seconds    | X,X           |
| 3     | 35 seconds    | 16,X          |
| 4     | 1:20 minutes  | 25,X          |
| 5     | 2:20 minutes  | X,X,X         |
| 6     | 3 minutes     | 20,5,5,X      |
| 7     | 3:20 minutes  | X,X,X + extra |
| 8     | 6 minutes     | 30,5,5,4,X    |
| 9     | 11 minutes    | X,X,X,X       |
| H     | until stopped | X,X,X,X,X,X   |

Any good chess player knows, though, that the surviving pieces rather than the move number indicates the stage of the



game. For example, the Exchange Variation of the Ruy Lopez, with queens off, is certainly not the same type of position at move 15 as a Najdorf Sicilian or a closed Ruy Lopez. This type of paradox throws the Voice into its endgame search and strategy (king towards the center) too early. It also keeps the Voice from going into the endgame when it should.

Voice Challenger often misses crucial moves when there is a mate "threat" for one side. The Voice will either announce mate or resign without true cause because it has forward pruned an obvious and simple defense to the forced checkmate. This further embarrassment to the Voice's forward pruning will hopefully persuade the programmers to incorporate a solid alpha-beta search in its program.

The new endgame heuristics of the Voice are good, and the program can apply pressure with aggressive use of

the king and other pieces. It's a bit more intelligent now in regard to passed pawns and pawn chain attack and defense. If the Voice's middlegame play can get it into an even or advantageous endgame, it is pretty capable of handling what used to be a severely weak stage in the game for all computers. After one side is mated, the Voice displays how many moves the game took.

Perhaps I have been too stinging, but one should expect a better chess program by this time and certainly one without the shortcomings I have mentioned. But the game, its features, and its operation are very pleasant to use. The play is adequate vs. an average person of moderate chess interest and experience. As a teaching instrument, I have found it to be quite excellent, improving most players about 200 points over a period of several months. Because it teaches

from its opening book, suggests moves, and is a good partner, one will surely improve even with limited use. If a computer chess game of a high caliber (above 1450) is truly needed, SARGON remains the only choice. But otherwise the Voice is a fine game that can be bought in various places for about \$100 less than SARGON. Since the Voice plays only slightly better than Challenger 7, it's up to the buyer to decide if he wants to pay for the improvements in use and operation of the game and in construction and looks. Since the Voice can be seen and used on display at many major department stores throughout the nation, such as Bloomingdale's, try it out there. If you decide to buy, pick it up at an electronics or camera store known for good service with good prices or from a mail order house — you'll save some money on a very good game. Check out Voice Challenger, you'll like it!

## BASIC Chess please!

R.D. Gilbert, of 592 Lincoln Way East, Chambersburg, PA, and a member of the South Penn Chess Club, liked Michael McCann's chess program for the PET (PC, Dec. 1979.) "I think that anyone who writes a chess program," says Gilbert, "such as Mike McCann's BASIC program for the PET, deserves a gold medal. My congratulations go to Mr. McCann. TRS-80 owners are eager for a BASIC chess program of their own which they can run on their computers. As far as I know, there have

been no specific chess programs written for the TRS-80. I sincerely hope that someone will convert the McCann program to run on a TRS-80 (or any other program in BASIC for the Z-80). This will enable chess buffs who own computers to run and work on the program. There has been a need for this for a long time now. After I get a few answers from Mr. McCann concerning several aspects of the program, I feel sure I can convert it to run on my TRS-80 . . . and hope to be able to make

some improvements. Please, please won't someone publish a chess program in BASIC for the TRS-80 . . . there are a lot of us, you know!"

(Stanley Sherwood of Brandon, VT, who wrote a checker program for the TI-59 programmable calculator, is now writing a checker program in BASIC for the TRS-80. So, if Stanley can do it in checkers, surely we have other crackerjacks who can do it in chess. — Ed.)

## Activities of the ICCA

Some of the highlight proposals that were adopted at last fall's 10th ICCA gathering, during ACM's annual convention in Detroit, were the following:

- a) The basic purpose of the ICCA is to encourage advances in the field of computer chess.
- b) Membership is open to anyone who makes application and pays current annual dues (\$10).
- c) The **Publication Board** of ICCA will encourage publication of technical

and non-technical works on computer chess — including the official ICCA Newsletter.

- d) A **Ranking Committee** will establish a rating or ranking system for programs and will rate and rank active programs.
- e) **Tournament Organizing Committee** will assist local organizers to the degree necessary with ICCA-sanctioned events. This Committee will organize the upcoming World Champi-

onship.

- f) **Sanctioning Committee** will give formal ICCA recognition to appropriate events.
- g) **Program Rights Committee** will decide on matters related to the rights of an individual to use a given program in ICCA-sanctioned events.
- h) **Standards Committee** will help develop program I/O standards to facilitate the automation of computer chess match play.



## Of Gifts, Medals and Tournaments

During the Detroit ICCA Chess Tournament, Monty Newborn was given a hand-carved Oriental chess set in recognition of all the time and work he's donated to computer chess tournaments since their beginning. In a nearby photo, Ben Mittman, long-time co-director of the tournaments, and guest George Koltanowski, watch Monty as he sets up a position on his new chess set. Koltanowski was recently honored by the Policy Board of the USCF because of his longtime work in promoting chess. The Board has created gold and

silver "Koltanowski Medals" for distinguished contributions to American chess.

Koltanowski, former President of the USCF, has joined *Personal Computing* and the Chafitz Company in making plans to organize the first "official" annual North American microcomputer chess tournament. One more sponsor is needed to help launch this much awaited development and several companies, including some of the chip manufacturers, are on the verge of joining.



## Classifieds

Rates for advertising in this section: \$1 per word. Minimum: 15 words. Allow two months for appearance (usual publication lag). Announcement of human tournaments that are open to computers published without charge. Send all submissions for this section to **COMPUTER CHESS CLASSIFIED DEPARTMENT**.

### COMPUTER POSTAL CHESS:

Join the First Annual North American "Open Computer Postal Chess Tournament." All computers are welcome to enter. Your program will play other programs in two consecutive games, Round Robin tournament style. You can participate from your own living room. Trophies to winners. Send your name and address for further details to Varn Fields, PO Box 8202, Philadelphia, PA 19101. 24-hour telephone: (215) 222-0367

### TIME ON YOUR HANDS

A new software disk, "Almanac," provides Apple users with a number of functions related to time, the calendar, and general astronomy. This comprehensive software package is intended for general Apple users, business men, amateur astronomers, shortwave radio listeners, and anyone interested in time calculations. "Almanac" requires an Apple II computer with at least 32K RAM, Disk II and Applesoft II in ROM. A printer is optional. It is sold for \$29.95 as Software Disk A7. Williams Publishing Company, P.O. Box 250, Fredonia, New York 14063.

### JOIN:

ICCA (International Computer Chess Association.) \$10 annual membership fee includes the ICCA NEWSLETTER with computer-chess news from all over the world. Send U.S. check or international money order to ICCA, Vogelback Computer Center, Northwestern University, Evanston, IL 60201.

### NEW! SARGON 2.5 MODULE!

Chafitz modular game system featuring the world's strongest playing microcomputer chess program! (Plays above 1500 level in tournament time.) We have SARGON 2.5 plus the Response Board in stock and available for immediate delivery! Write or phone, 24 hours a day for free discount price list, brochure, and an in-depth technical report. Palmer, McBride and Kinkaid Associates, PO Box 598, East Brunswick, NJ 08816. Tel. (201) 246-7680.

### GOMOKU FOR NORTH STAR

Five Stones Software Gomoku program has been written by the current North American champion and has the following features: (1) book of openings with 200 entries, (2) fast response to a four being played, (3) ability to take back moves, (4) 19 x 19 board, (5) blinking of last move by computer, (6) carriage return not necessary for most moves, (7) recent moves displayed along with board, (8) ability to customize to different screen sizes.

The program requires a minimum of 32K bytes of RAM. Available for North Star or CP/M on double density 5-1/4" diskette for \$29.95. Available in cassette for the TRS-80, Level II, 32K. \$29.95 also. Visa or Mastercharge accepted. For more information contact Five Stones Software, P.O. Box 1369, Station B, Ottawa, Canada, K1P 5R4

### THE JOY OF CHECKERS

Explore, enjoy checkers! Send for rules, pointers, sample magazine, membership benefits. Our bet: \$5,000 on World Champion Tinsely against any computer! American Checker Federation, 3475 Belmont Ave., Baton Rouge, LA 70808.

### ENTER A GOMOKU TOURNAMENT

Do you have a GOMOKU program? Would you like to write one? Those with own programs can enter an International GOMOKU Tournament and, if #1, can take on the European champ. For more information write to Dr. Shein Wang, Institute of Computer Science, U. of Guelph, Guelph, Ontario, N1E, 1C8.

### BRIDGE PROGRAM

For those who would like to add my standardized bridge dealing sequence to their Duisman programs: If they will send me a check for \$3 (to cover incidental costs) I shall be glad to send the code. Thomas A. Throop; 8804 Chalon Drive, Bethesda, MD 20034.

### GERMAN TREATISE (correction)

Prof. Herbert E. Bruderer, director of the Institute of Non-Numerical Information Processing in Rorschach, Switzerland, has published a new book which includes sections on computer chess. Written in GERMAN, "NICHTNUMERISCHE INFORMATIONSVERARBEITUNG" deals with Computational Linguistics; Artificial Intelligence; Computer Chess, in detail; Automatic Documentation; Library Automation; Computer Law; and Computer Art. Price of the 202-page book is 44 Swiss Francs (air mail). Foreign orders must be prepaid. Herbert E. Bruderer, INIV. Thaler Strasse 8, PO Box 409, CH-9400, Rorschach, SG Switzerland.



# COMPUTER GAMES Of Strategy and Logic

*Latest Movements in Checkers*

## A Checkers Debate

*The January 1980 edition of Scientific American included a discussion of checkers by Martin Gardner, 22 years editor of the Mathematical Games department for that magazine. Burke Grandjean read Martin's article and has responded with his own bristling dissensions. The italicized quotes are from Martin Gardner's article, "Checkers, a game that can be more interesting than one might think." The original article appeared in Scientific American's Mathematical Games Department. "My comments," writes Burke Grandjean in his analysis, "are directed at specific statements made by Martin Gardner. I hope no one thinks I am being too shrill in my opinions. I've had my nose bloodied so often by the intellectual snobbery of chess fans that I'm afraid I've become hypersensitive on the subject of checkers vs. chess."*

**MG** wrote that *sure, checkers is probably the best known board game in the world, but it is below chess in available literature, and in the number of adults who become experts.*

**BG** "The literature on checkers may be greater than you think. Irving Windt, a collector from Florida, recently sold his checker library containing thousands of volumes, for \$50,000. And I wonder if there really are more adults who are top level chess players compared to checker players? Our 2500 ACF members are experts compared to the 25 million who think they play."

**MG** said that *chess rules are pretty much standardized around the world. But not so for checkers. Outside of English speaking countries there are dozens of different variations.*

**BG**: "Not so. The English version of

checkers is played in all the English-speaking countries — England, Ireland, Wales, Scotland, Canada, USA, Australia and New Zealand. Italy also plays this version and the ACF has six or seven members there. We also have three members in Malta and three in Barbados (and certainly there are many more players there.)"

**MG** believes that *checkers is simpler than chess. A grand master at checkers is less likely to make an error than a grand master at chess. This is one of checkers' great attractions.*

**BG**: "I strongly object to the statement that checkers is simpler than chess. Chess players think so, the general public thinks so, but that doesn't make it so. The rules are simple — the game is deep. Masters like Dr. Marion F. Tinsley, of Florida A&M, consistently look at board positions 30 to 40 plies ahead. Quoting Tinsley: 'Playing chess is like looking out over a limitless ocean; playing checkers is like looking into a bottomless well.' Tinsley is a better-than-average chess player, by the way. He was on a US college team that toured Europe during his undergraduate days."

**MG** said that *checker buffs love to quote Edgar Allan Poe's introduction to THE MURDERS IN THE RUE MORGUE: 'I will, therefore, take occasion to assert that the higher powers of the reflective intellect are more decidedly and more usefully tasked by the unostentatious game of draughts than by all the elaborate frivolity of chess. . . .'*

**BG**: "Checker players wish Poe had left the last part of his comment out of his work. His later reference to a 4-king ending exposes Poe as the merest of tyros."

**MG** said that *because of the simplicity of checkers, computer programs therefore play a much stronger game than do computer-chess programs.*

**BG**: "That statement simply has no basis in fact. There are no checker programs known to me that play even a Class B game. Dr. Samuel's program may have 'learned' to play better than

he by applying his rules more accurately, but it never learned to get as much as a draw against K.D. Hanson, California expert who worked with Dr. Samuel in his checker programming. And Dr. Samuel's program lost 8 out of 8 to Hellman and Oldbury before their world match in 1965. It also lost to Robert Nealey, a blind man."

**MG** mentioned that *in recent years Duke University had developed a powerful program of the non-learning type by Eric C. Jensen and Tom R. Truscott, two graduate students working with Dr. Alan W. Biermann, who teaches artificial intelligence. Biermann is also quoted as saying that the Duke program will someday become world champ.*

**BG**: "In annotating the 1977 Duke vs. Samuel programs — 2 games — ACF Games Editor Richard Fortman made this comment: 'The end-play, especially in Game 2, was terrible. I should say, at present, there are several thousand just average Class B players who could beat either computer without difficulty.' Subsequently, the Duke program played Elbert Lowder 5 games, losing 2, winning one, and drawing 2. In the game the computer won, it was in an early loss, but Lowder managed to lose carelessly! Dr. Biermann's opinion that the Duke program is close to world champion status is ludicrous. I enjoyed the article and appreciate the exposure for checkers in the SCIENTIFIC AMERICAN. I hope readers will be able to balance out some of the slant which favors chess. If not, we checker players have fought against a poor image (cracker-barrel, country store) for 75 years or so — so one more poke won't hurt. I had hoped our challenge by Tinsley would get chess players to take checkers seriously. But computer magazines continue to play the same tune that checkers has been completely mastered by computers! And Dr. Biermann says his program would win a few games from Tinsley! Would he expect a program to win a chess game against Karpov?"

*News on "Intelligent" Computer Games of Backgammon, Checkers, Gomoku, Go, etc., welcomed by this department. Computer Chess and Computer Bridge appear separately. Address all correspondence to Computer Games Dept., Personal Computing.*



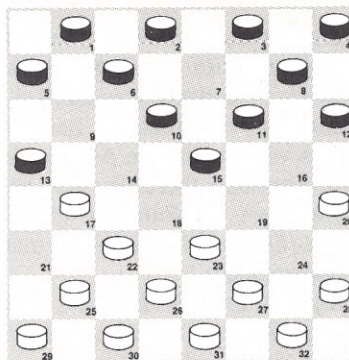
# A Study in Openings

The following item from Dick Fortman appeared in this column last year:

"About seven or eight years ago, an ACF member who, at the time, worked as a computer engineer, asked if 3 or 4 checker experts would volunteer to help him evaluate opening checker moves. Four of us accepted, including Asa Long, a former world title-holder. The initial step was to grade the seven opening Black moves on a 1 to 7 scale with 1 being the strongest and 7 being the weakest. Examples of this evaluation for Black were 11-15 (1); 9-14 (2); 11-16 (3); 10-15 (4); 10-14 and 12-16 (5-6); and 9-13 (7). Then the White responses were graded, making a total of 47 openings (two were excluded; as 9-14, 21-17 and 10-14, 21-17 are outright losses). After that, we proceeded into the 3-move restriction which produced a total of 144 sound book openings. We then went on into the uncharted 4-move sequences, which resulted in something like 540 possibly sound sequences. All of these were on computer printouts. Interestingly enough, the computer recognized transpositions, and eliminated them: such as 10-15, 23-18, 7-10 being the same formation as 11-15, 23-18, 7-11, etc. However, after getting into the 5th move sequence, the total proved so bulky that the work had to be abandoned at that time. The project was conducted by Herschel Smith of 50 Wilshire Drive, Spring Valley, N.Y."

A letter of inquiry to Mr. Smith produced the following response:

"In the experiment mentioned by Dick Fortman, I was searching for ways to apply the computer to the game of checkers (other than using it to play the game). As he indicated, the volume of moves quickly overwhelmed us. I regret to say that I did not keep any results of this exercise. I have since explored other possibilities but cannot say that I've discovered anything very earth-shaking. It appears to be quite simple to use the computer to find 'transpositions;' i.e., alternate ways to



An experimental opening

arrive at the same board position. Since each move in checkers transforms a given board position into a new board position, one needs only to represent these positions by numbers for several games. Then by sorting the number numerically, wherever duplicate numbers appear, you have identified a transposition. With a little extra work, this technique can be used in determining identical positions with reversed colors.

"I have applied this technique to all possible moves (after eliminating losses) at each stage for the first five moves. The conclusion is that there are a large number of duplicate positions. More precisely, there are a large number of **routes** to the same position even at this early stage of the game. Roughly 1170 different positions can be arrived at with the first five moves (excluding obvious losing positions.) Furthermore, there are something like 3830 different 'order of moves' that can be taken to arrive at these 1170 positions. To illustrate this with an extreme example, the position resulting from the sequence of moves: 9-13 21-17 10-15 24-20 7-10, shown in experimental 'opening' diagram, can also be arrived at by eleven other routes:

- |    |       |       |       |       |      |
|----|-------|-------|-------|-------|------|
| 1) | 9-13  | 21-17 | 11-15 | 24-20 | 7-11 |
| 2) | 9-13  | 24-20 | 10-15 | 21-17 | 7-10 |
| 3) | 9-13  | 24-20 | 11-15 | 21-17 | 7-11 |
| 4) | 10-14 | 21-17 | 7-10  | 24-20 | 9-13 |
| 5) | 10-14 | 21-17 | 9-13  | 24-20 | 7-10 |
| 6) | 10-14 | 24-20 | 7-10  | 21-17 | 9-13 |
| 7) | 10-14 | 24-20 | 9-13  | 21-17 | 7-10 |
| 8) | 11-15 | 21-17 | 7-11  | 24-20 | 9-13 |

- |     |       |       |      |       |      |
|-----|-------|-------|------|-------|------|
| 9)  | 11-15 | 21-17 | 9-13 | 24-20 | 7-11 |
| 10) | 11-15 | 24-20 | 7-11 | 21-17 | 9-13 |
| 11) | 11-15 | 24-20 | 9-13 | 21-17 | 7-11 |

"In trying to apply the computer to checkers it appears to be more useful to consider things from a perspective somewhat different than the conventional way. **Board positions** seems to be more useful than **moves**. Many checker books refer to 'winning move' but it appears to me that there are no winning moves, but rather only correct responses to 'losing moves.' In connection with my research of the first five moves I tried an analysis of the losing moves to find why they were losing moves. I produced about 40 different categories of losing moves. The largest number of losing moves falls in a category that no checker player would ever think of making: **'outright give away,'** such as 9-13 23-18 13-17.

"The next largest category is what I call **'unrecoverable pitch,'** for example, 9-14 22-17 14-18. Next largest appears to be the simple **'two for one,'** for example, 9-14 22-17 12-16. The next most numerous category I call **'sequence of jumps that sets up a 2 for 1,'** for example, 9-13 22-18 12-16 25-22 11-15. After the jumps have been completed it is clear that white has a 2 for 1 jump. These moves would be made only by a rank amateur. Another example that is not quite so transparent would be the category I describe as: **'2 for 1, squeeze to equalize, structural (or waiting move), 3 for 1,'** for example, 9-13 22-18 12-16 26-22 10-14. After the exchange 18-9 5-14, white has the 2 for 1 (23-19 16-23 27-9). On the surface, however, it looks as though black can equalize by squeezing 1-5. But white makes what I call a structural move, 30-26, which puts him in position to execute a 3 for 1 after black jumps 5-14. I distinguish between a waiting move and a structural move in this way: a waiting move is any move made to allow your opponent to make a jump but otherwise plays no part in the subsequent play; a structural move is like a waiting move but is **essential** to the subsequent play. The 40 categories are by no means exhaus-



tive. I am certain there are many more when you go to 6, 7, 8, or more moves. Also, losing moves that require a large number of subsequent moves to enforce the win defy my capability to categorize them.

"Another technique that I have used on the computer relates to representing a concise method of recording games. It is a way of representing moves by the use of a single character for each move. In the example above the sequence of moves by traditional notation is 9-13

22-18 12-16 26-22 10-14 18-9 5-14 23-19 16-23 27-9 1-5 30-26 5-14 22-17 13-22 26-1. Using my single character notation, it becomes this: 1378411511161212 The method is based on this principle: at any given move, there are only a finite number of possible moves, usually 6 or 7. To determine how to code a particular move, rank all the moves in numerical order and use the rank to represent the move. In the example given, the third move is 7 because at that point there are

only 8 possible moves on the board for black, and if you rank them in numerical order, 12-16, is the 7th move. This is really not of much use except for computer work. It is a simple task to have a routine that translates the single character notation to the conventional notation and vice versa. If there are more than 9 possible moves, use A,B,C, etc for 10, 11, 12. I hope this has given you some of the flavour of what I have tried to do with computers and checkers."

## Program for the TI-59

Stanley R. Sherwood, of RD #3 McConnell Rd., Brandon, VT 05733, has written a checker program for the TI-59 (a programmable calculator.)

"The first primitive version of my checker program used 32 memory registers for the board. Since there is a limited number of legal checker moves from any square all moves from every square can be predicted in advance. These legal moves were written into the program. To find the best move the program would simply look one move ahead evaluate the move by limited positional advantage and material gain. The program would make moves in about 3 minutes.

"The current version has many improvements over the original and plays a much more sophisticated game although much slower. To allow the expanded program to fit into the TI-59 memory capacity the board has now been packed into 4 memory registers (8 positions per memory). The move evaluation subroutine of the revised version will evaluate all possible first moves for itself as well as possible response moves by its opponent and then make its move based not only on positional advantage and material gain as in the original version but also on the negative effects this move would generate by way of a response move by an opponent. The program will make a move in from five to fifteen minutes.

"The sample game enclosed contains some comments. The calculator's beginning and middle game are good. However, I must admit the program makes outrageous errors in the end

game. Starting at about move 35 in the sample game the calculator's good game falls apart. It's two-move look ahead is simply not enough to do anything constructive.

"The TI-59's memory capacity is approximately 1 K bytes. The checker program uses about 800 bytes for instructions and the rest for the checkerboard and other variables.

"I continue to be amazed by the response to this program. Since the time it first appeared in the Texas Instruments catalog I have received many letters from all over the country as well as England and Australia, all of which has been a gratifying experience. I don't know of any checker program using this little memory. TI has a ROM chip

that will allow 40,000 bits of storage. However, the expense is high. I think I could write a much stronger program for the calculator if I had access to more memory. If you have a TI-59 and would like a copy of this checker program, write to TI, PPX Dept.; PO Box 53; Lubbock, TX 79408. The program is called simply 'Checkers by Stanley Sherwood.' The listing sells for about \$5 and the magnetic card that you will need for it sells for \$1."

### BLACK- TI-59 Programmable Calculator WHITE- Stanley Sherwood

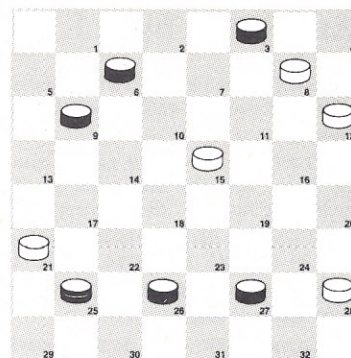
|              |       |
|--------------|-------|
| 1. 11-15 (A) | 22-18 |
| 2. 15-22     | 25-18 |
| 3. 10-14     | 26-22 |
| 4. 12-16     | 29-25 |

### Comments by Stan Sherwood

- A) A few book moves have been programmed into the opening.
- B) Calculator makes an excellent move.
- C) Calculator wisely protects itself from set up.
- D) I set up for a jump.
- E) So does calculator.
- F) I double jump!
- G) So does calculator!
- H) An even exchange.
- I) I overlooked this jump. so calculator puts me behind.
- J) Calculator sneaks a piece through.
- K) While the machine dallies, I get my king.
- L) I sneak through for another king.

M) As has been obvious for the past few moves, the TI-59 has fallen completely apart in the end game.

N) Game called at this point with white declared the winner. Although this is not a gem, it is a nice demonstration of a checker game written with only 1K OF AVAILABLE MEMORY!



After move 24, calculator seems to have upper hand



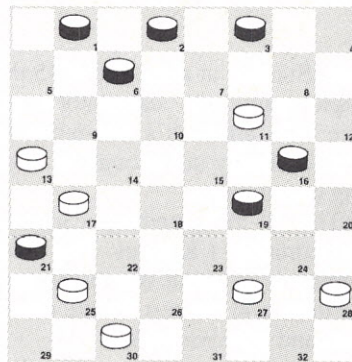
# COMPUTER GAMES

|               |           |               |           |               |           |
|---------------|-----------|---------------|-----------|---------------|-----------|
| 5. 6-10       | 24-20     | 17. 14-23     | 26-19 (H) | 29. 9-14      | 15-11     |
| 6. 7-11       | 22-17     | 18. 7-14 (I)  | 30-26     | 30. 14-18     | 11-8 (L)  |
| 7. 10-15 (B)  | 17-10     | 19. 20-24     | 26-23     | 31. 18-22     | 8-4       |
| 8. 15-29      | 28-24     | 20. 24-27 (J) | 19-15     | 32. 3-7       | 12-8      |
| 9. 29-25 (C)  | 24-19     | 21. 1-6       | 23-19     | 33. 7-10      | 8-3       |
| 10. 11-15     | 19-12     | 22. 14-18     | 19-16     | 34. 10-15     | 3-7       |
| 11. 9-14      | 20-16     | 23. 18-23     | 16-11     | 35. 15-19     | 7-11      |
| 12. 15-19     | 31-26     | 24. 23-26     | 11-8      | 36. 25-30     | 11-15     |
| 13. 5-9       | 32-28     | 25. 9-14      | 8-4 (K)   | 37. 30-25 (M) | 15-31     |
| 14. 2-7       | 27-24 (D) | 26. 14-18     | 4-8       | 38. 25-30     | 16-19     |
| 15. 8-11 (E)  | 24-8 (F)  | 27. 18-23     | 8-11      | 39. 30-25     | 19-15     |
| 16. 24-20 (G) | 23-18     | 28. 6-9       | 11-16     | 40. 25-30     | 15-18 (N) |

## New Program in Action

"Autocheckers" by Lon Rater Software, Inc., PO Box 57007, Webster, TX, 77598 is a program that plays the standard, English version of checkers, and runs on an APPLE II computer equipped with at least 16K of RAM. The board is displayed in high-resolution graphics in color, or black and white. The program is written in a combination of integer BASIC and 6502 machine language. In the game presented here, the computer always moves first. A later modification by Lon Rater permits either side to move first, and also provides a problem mode — or board editing feature — so that specific positions can be set up. AUTOCHECKERS can be played at 7 levels with the highest level examining 8 moves — 4 by each player. Response time at this level averages just over one minute. A useful feature at levels 6 and 7 is a bell that sounds to indicate computer has moved. ACF Bulletin Editor Grandjean played 8 games at Level 7 to

BLACK — W.B. Grandjean  
WHITE—"AUTO CHECKERS" (computer)



Black to move and win with 16-20

evaluate its standard of play, winning 6 and drawing two. Games Editor Fortman gives an analysis of one of the drawn games. He also gives readers a chance to test their checkers skills. Looking only at the diagram, can you move black 16-20 and win? (If not, see Fortman's game annotations.)

| Black        | White    |
|--------------|----------|
| 1. 11-15     | 22-18(A) |
| 2. 15-22     | 26-17(B) |
| 3. 8-11      | 17-13(C) |
| 4. 11-15(D)  | 23-18    |
| 5. 15-22     | 25-18    |
| 6. 4-8       | 31-26(E) |
| 7. 8-11      | 24-20    |
| 8. 10-15     | 26-22    |
| 9. 15-19(F)  | 21-17    |
| 10. 19-23(G) | 29-25    |
| 11. 11-16(H) | 20-11    |
| 12. 7-16     | 18-15(I) |
| 13. 9-14     | 27-9 (J) |
| 14. 5-21     | 15-11    |
| 15. 16-19    | 32-27(K) |
| 16. 12-16    | 22-17(L) |
| 17. 6-10(M)  | 13-9 (N) |
| 18. 10-15(O) | 25-22    |
| 19. 16-20    | 17-13(P) |
| 20. 3-7      | 11-8     |
| 21. 7-10     | 27-23*   |
| 22. 19-26    | 30-23    |
| 23. 21-25    | 22-17    |
| 24. 25-30    | 9-6      |
| 25. 2-9      | 13-6     |
| 26. 30-26    | 6-2      |
| 27. 26-19    | 2-7      |
| 28. 19-23    | 7-14(Q)  |

DRAWN

## Annotated by R.L. Fortman, ACF Games Editor

A) The 'Single Corner', one of the oldest known to the game, with published records dating back to the Spanish authors of the 15th century.

B) Practically all board games emphasize center control. We do not know why this and other small computers tend to disregard such basic strategy. 25-18 is proper, with an even position.

C) White is in dire straits at an early stage. A theoretical draw exists with 23-18, 9-14, 18-9, 5-14, 24-19, 11-15, 28-24, 4-8, 25-22 etc.

D) Or 9-14 to discourage 25-22 by the 14-17 break-up. But the move taken is sufficient.

E) Unnecessary, as it further weakens the White position, but again, a move commonly seen in these small computers. 24-19 or 29-25 is more logical.

F) Mr. Grandjean has complete control of the board.

G) 7-10 (intending 9-14 next) doesn't work out after 17-14 and the 3x3.

H) To prevent the 18-14 exchange, and also sets up a small trap.

I) If 18-14, 9-18, 22-15, then Black has a quick win with 23-26, 30-23, and 6-9 etc.

J) If 17-10, 2-7, 27-18, 7-23, forcing 18-15, then 16-19, 11-8, 12-16, 8-4, and 23-26 etc. Black wins.

K) To stop the 19-23 advance.

L) See diagram and challenge. Black to move and win. (Beginning with move 16-20)

M) Here 16-20, 25-22 (if 17-14, 1-5 wins.) 1-5, 30-26 and White has no tenable defence against the threat of the soon to be crowned king; 21-25, and 25-30. . .

N) The computer, given breathing room, responds correctly.

O) Of course, Black is unable to press 1-5 because of 27-24.

P) The correct, and most momentous decision, using 3 minutes, forcing Black to break his king row fortress.

Q) A well-conducted end-game, after Note N. Average time of the computer was 1 min, 3 seconds, (with single jumps omitted). The longest, 3 min; & the shortest, 4 seconds.



## Some New Programs Appear

BY THOMAS A. THROOP

This month I have a number of different topics to discuss. Let's begin with a deal generated by my dealing sequence standardized for the PET, TRS-80, and APPLE versions of George Duisman's bridge programs. The deal is number "39", as follows:

|                                                                                                   |                                                                                                       |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;">NORTH<br/>(Dummy)</p> <p>♠ AKJ8<br/>♥ AQ8<br/>♦ Q10964<br/>♣ 9</p> | <p style="text-align: center;">SOUTH<br/>(Declarer)</p> <p>♠ —<br/>♥ J9652<br/>♦ J832<br/>♣ Q1073</p> |
| <p style="text-align: center;">COMPUTER<br/>WEST</p> <p>♠ 109432<br/>♥ K<br/>♦ A75<br/>♣ AJ64</p> | <p style="text-align: center;">COMPUTER<br/>EAST</p> <p>♠ Q765<br/>♥ 10743<br/>♦ K<br/>♣ K852</p>     |

I played this deal against both the PET version and the TRS-80 version of the Duisman program. The contract I chose was 4 hearts. The opening lead by the PET version was the 2 of spades, while the opening lead by the TRS-80 version was the 10 of spades. After the opening lead, the play of the East-West cards was the same by both program versions.

At trick 1, I played the jack of spades from dummy. The computer as East covered with the queen and I ruffed with South's 2 of hearts. Next, I finessed for the heart king by leading a small heart from South. This is the proper play (rather than leading the Jack of hearts) to guard against the exact trump distribution shown. The computer as West played the singleton king of hearts, which I won with North's ace. Then I cashed dummy's queen of hearts followed by the heart 8 to finesse East for the marked 10. On

the finesse, East played the heart 7, and I played South's 9 of hearts to win the trick. West's two discards were a small spade and the 5 of diamonds. At trick 5, I cashed South's heart jack, drawing East's 10 of trumps. West discarded the 7 of diamonds, and I discarded the spade 8 from dummy.

The problem was how to play the diamond suit. It looked as though East-West could win two diamond tricks and two or three club tricks to set the 4 heart contract by one or two tricks. I thought that the defense might be more difficult for the computer if I could entice West to win the first diamond trick. I therefore led the diamond jack from South's hand. The result was a happy surprise! West played high, (the ace of diamonds) and dropped East's singleton king. The diamond suit was now set up. The contract could still be defeated, however, if West shifted to a low club to East's king, followed by club continuation from East. However, at trick 7, West led another spade. I won with North's king, cashed the ace, and ran the diamond suit to make 5 hearts! Suppose that at trick 6 I led the deuce of diamonds, rather than the jack? I'll let you find out the answer with your copy of the Duisman program.

For those who would like to add my standardized dealing sequence to their Duisman program, please note the announcement in the Computer Chess Classifieds. For those who already have the standard dealing sequence or who are planning to order it, here are some interesting deals to play: deal 40 at 4 hearts, deal 41 at 2 no-trump, deal 52 at 4 spades, and deal 54 at 3 no-trump. I'll comment on these deals in next month's column.

While on the subject of dealing sequences, elsewhere in this issue of PC appears a description by Peter Jonas of his code for generating bridge deals and setting up various arrays for infor-

mation pertinent to a deal. With this code as the first building block, you can develop and add your own bridge bidding and/or playing logic to Peter's code. One thing Peter has not provided for in his dealing sequence is the capability to regenerate a given deal from a specific random number "seed". This requires building into his program a pseudo random number routine.

A letter from Jim Hilger informs me that he has made several improvements to his TRIK 1.0 bridge program. New features in this improved version, called TRIK 1.1, include:

1. Slam bidding.
2. Chicago scoring.
3. Vulnerability determination and contract doubling.
4. Improved defensive play logic.
5. Repositioning of hands when North is declarer, so that East will lead and South will be the dummy.

Deal "21" illustrates the new slam bidding feature. The deal and the bidding in which the computer program reaches 6 no-trump with the East-West cards are shown below:

TRIK 1.1  
DEAL #21  
(Not vulnerable.)

|                                                                                       |                                                                                       |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <p style="text-align: center;">NORTH</p> <p>♠ J10763<br/>♥ 64<br/>♦ 42<br/>♣ KJ53</p> | <p style="text-align: center;">EAST</p> <p>♠ AQ54<br/>♥ AK975<br/>♦ K6<br/>♣ Q10</p>  |
| <p style="text-align: center;">WEST</p> <p>♠ K92<br/>♥ 10<br/>♦ AQ873<br/>♣ A964</p>  | <p style="text-align: center;">SOUTH</p> <p>♠ 8<br/>♥ QJ832<br/>♦ J1095<br/>♣ 872</p> |



# COMPUTER BRIDGE

| BIDDING: |      | (North dealt) |      |
|----------|------|---------------|------|
| (You)    |      |               |      |
| SOUTH    | WEST | NORTH         | EAST |
| Pass     | 2D   | Pass          | 1H   |
| Pass     | 4C   | Pass          | 3N   |
| Pass     | 5H   | Pass          | 4N   |
| Pass     | 6D   | Pass          | 5N   |
| Pass     | Pass | Pass          | 6N   |

East opens 1 heart, West responds with 2 diamonds, and East very reasonably jumps to 3 no-trump. West should pass but the computer bids 4 clubs, apparently to show the club suit. Whatever the reason for the club bid, the computer, as East, now uses the Blackwood convention to ask West for the number of his aces and kings. West's bid of 5 hearts shows 2 aces, and his bid of 6 diamonds shows 1 king. East now bids 6 no-trump, the final contract. As you can see, this contract turns out to be a little too optimistic, with only 31 high card points in the combined E-W hands and neither the spades nor diamonds splitting evenly. Five no-trump can be made.

Another deal which Jim sent me is number "9". Jim and his computer partner, North, reached a contract of 6 spades. The deal, the bidding, and the play of the cards are shown below:

TRICK 1.1  
DEAL #9  
(Both sides vulnerable.)

|         |  | NORTH    |  |
|---------|--|----------|--|
|         |  | ♠ J92    |  |
|         |  | ♥ 10     |  |
|         |  | ♦ AQ873  |  |
|         |  | ♣ A964   |  |
| WEST    |  | EAST     |  |
| ♠ 8     |  | ♠ K10763 |  |
| ♥ QJ832 |  | ♥ 64     |  |
| ♦ J1095 |  | ♦ 42     |  |
| ♣ 872   |  | ♣ KJ53   |  |
|         |  | SOUTH    |  |
|         |  | ♠ AQ54   |  |
|         |  | ♥ AK975  |  |
|         |  | ♦ K6     |  |
|         |  | ♣ Q10    |  |

| BIDDING: |      | (West dealt) |        |
|----------|------|--------------|--------|
| (You)    |      |              |        |
| SOUTH    | WEST | NORTH        | EAST   |
| 2H       | Pass | 1D           | Pass   |
| 3S       | Pass | 4S           | Pass   |
| 4N       | Pass | 5H           | Pass   |
| 5N       | Pass | 6C           | Double |
| 6S       | Pass | Pass         | Double |
| Pass     | Pass | Pass         |        |

Contract: 6S Doubled Vulnerable  
PLAY: (East-West is computer.)

|    | W  | N  | E  | S  |
|----|----|----|----|----|
| 1  | 2H | TH | 4H | 5H |
| 2  | 8S | JS | 3S | 4S |
| 3  | 2C | 2S | 6S | QS |
| 4  | 5D | AD | 2D | 6D |
| 5  | 3H | 9S | TS | AS |
| 6  | 7C | 4C | KC | QC |
| 7  | 8C | 6C | 3C | TC |
| 8  | 9D | 3D | 4D | KD |
| 9  | 8H | 9C | 7S | 5S |
| 10 | JH | 7D | KS | 7H |
| 11 | QH | 8D | 6H | AH |
| 12 | TD | QD | 5C | KH |
| 13 | JD | AC | JC | 9H |

Result: Down 2 Tricks.

Notice the resemblance to deal "21"? The king and jack of spades have been interchanged, and the hands have been rotated one position. I shall have to ask Jim why his dealing sequence produces these two deals so nearly identical (assuming, of course, it is not a random result).

At any rate, on this deal Jim and computer North reached an overly optimistic contract of 6 spades. Let's look at the play. Jim received a very favorable opening lead of a small heart from computer West, permitting North's 10 to win the first trick. Jim now led the jack of spades from North to finesse for the king. Here the computer algorithm for East's play does not cover the jack with the king, which is an error. Next, Jim led the 2 of spades from North, finessing with South's queen to win the trick. The bad trump split is now revealed, and any hope of making the contract vanishes.

At trick 4, Jim elected to enter dummy with the ace of diamonds in order to lead the 9 of spades from the dummy. However, now in a situation similar to that at trick 2, East this time correctly covers the spade lead from dummy, which he did not do before. Jim took East's 10 with the ace to win the trick. Now he probably should have cashed the king of diamonds, crossed to dummy with the ace of clubs, and cashed dummy's queen of diamonds, planning to discard his losing queen of clubs if East should follow suit or if East should ruff. Instead, he led the club queen, losing to East's king. For

East the computer should now return anything but a club, (the king or 7 of spades followed by a heart or diamond being best.) However, East returned the 3 of clubs, giving Jim a trick with his 10.

The play continues as shown. At trick 9 the computer as West does not realize that it is safe to discard diamonds and chooses to discard the eight of hearts. This allows Jim to win the last trick with the heart 9, which otherwise would have been a loser. His final result was down 2 tricks.

Another commercial bridge product on the market has come to my attention. This is Bridge 2.0, a product of Dynacomp of Webster, New York. Versions of Bridge 2.0 exist for the TRS-80 (Level II), the APPLE II, and the North Star computers.

I have acquired the TRS-80 version of Bridge 2.0 and will discuss the product more fully next month. Regarding the user oriented features of Bridge 2.0, there are a few problems. First, the timing of the play of the cards on the screen is such that often the screen is cleared before you have had a reasonable opportunity to see what cards have been played. Second, and I think a serious shortcoming, if you have chosen the "contract" as opposed to the "duplicate" mode, you cannot retrieve the deal for immediate or future replay. You cannot even look at the deal once you have finished playing all thirteen tricks. Actually, the distinction between their use of the terms "contract" and "duplicate" is incorrect. Duplicate is one form of contract bridge. For Dynacomp's purposes, the two modes should probably be termed "rubber bridge" and "duplicate bridge". On another point of terminology, "rounds" are referred to rather than tricks. Finally, when you are obliged to play a singleton when following suit, the play is not made for you automatically.

Bridge 2.0 allows you to bid and play the South cards of a deal, while the computer bids and plays as your partner. The program will also bid and play the East and West hands. My first reaction to the bidding aspect of the program is that it is too incomplete to allow you, in many cases, to reach a sensible contract. One example of this is Bridge



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## COMPUTER BRIDGE

2.0's deal "34" in the "duplicate" mode:

| NORTH<br>(Computer) | SOUTH<br>(You) |
|---------------------|----------------|
| ♠ 762               | ♠ K            |
| ♥ JT965             | ♥ KQ872        |
| ♦ 5                 | ♦ J2           |
| ♣ QJ65              | ♣ AKT74        |

With West the dealer, my bidding sequence with the Dynacomp program was as follows:

| BIDDING |        |      |       |
|---------|--------|------|-------|
| WEST    | NORTH  | EAST | SOUTH |
| 1D      | Pass   | 1S   | 2H    |
| 3D      | Pass   | Pass | 4C    |
| Double  | Pass?? | Pass | Pass  |

Disregarding West's third round double, which I don't believe has any effect on North's third round bid, North should never pass 4 clubs in preference to returning to 4 hearts. Even with the same number of hearts as clubs, North should choose my first bid suit, hearts, as trump, and in this deal the heart length is greater!

Another example is one of the first few deals I played in the "contract" mode. The deal is as follows:

| NORTH<br>(Computer) | SOUTH<br>(You) |
|---------------------|----------------|
| ♠ T87               | ♠ AQJ954       |
| ♥ AT643             | ♥ KQ7          |
| ♦ KT7               | ♦ AQ           |
| ♣ J4                | ♣ A3           |

West, as the dealer, passed. My partner, North passed, as did East. With the South hand I made a textbook opening bid of 2 spades. After a pass by West, North passed! First of all, in the Goren bidding system, which Bridge 2.0 is supposed to be playing, an opening 2-bid cannot be passed. Second, from any double dummy viewpoint, North-South should arrive at either 6 or 7 spades for a final contract. This cannot happen if North passes my opening 2 spade bid.

I shall be playing more deals with Bridge 2.0 in the next few weeks to learn more about its bidding and to investigate its playing.

If you have one or more of the commercial computer bridge products or are developing your own bridge software, please let me know. I'll be glad to include some of your comments in this column.

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CIRCLE 29



# Green Screens and Backgammon

This month is potpourri with two sophisticated games and a TRS-80 accessory that doesn't fall into the software category.

First, the accessory. The item, called a CRT Screen-Model I, is a green tinted, plexiglas rectangle that fits over the TRS-80 video screen. I spend many hours in front of my micro in the course of a week. After a couple of four- to six-hour sessions, eye fatigue sets in and I find I have to get away from the machine for a while to rest or do something else. The CRT Screen from National Tricor, Incorporated, appears to put an end to that eye strain.

The screen is optically correct, an eighth of an inch thick and durable. It has several adhesive strips on one side for attaching the screen to the video. At first, the video looks a little strange without its recessed display screen as the dark green glass squares off the video display. Turning on your TRS-80 will also be a strange experience as the DOS READY or MEMORY SIZE? prompts appear green against a light green background instead of the usual white letters against the grayish tones of the video.

It takes time to get used to the change of color. For the first half hour or so, I wasn't sure I liked the change as I was used to the white on gray. Having used the screen for some time now, however, I can honestly say that I don't think I'll ever take it off. While I'm not an eye doctor, I find I now can spend many hours in front of my machine without noticing how long I've been there. The green colors also give more life and sparkle to games and graphics. When I run a graph program I utilize frequently, the result looks like it's coming off the video of a large terminal. The more I use the complement, the more I like it.

CRT Screen Model I is priced at \$19.95; a version for the TRS-80 Model II sells for \$24.95. They are sold with a 30-day, money back guarantee from National Tricor, Incorporated,

3335 Greenleaf Blvd., Kalamazoo, Michigan 49008; (616) 375-7519.

The games I mentioned earlier are two versions of Backgammon. Both have provided hours of relaxation.

Until very recently, the only thing I knew about Backgammon was that it existed; I had never had the opportunity to play. I knew that in many circles of society it was "the rage," but there always seemed to be other things to do in life. I wasn't even sure why it would be fun to move little round chips over a bunch of triangles. All that was to change.

In dealing with Scott Adams to review some of his Adventure games (see the February issue of *Personal Computing*), Scott sent along a Backgammon game he wrote in Basic. Though more interested in Adventure, I put the Backgammon tape on my TRS-80 to see what it was all about.

The first couple of times I played were disaster. What appeared to be a race around the Backgammon board was evidently something else because I was getting thrashed easily.

Hmmmm... The next step was to buy a book and find out what the game was actually about. To make a long story shorter, I began to learn how to play. From Scott's version, I went to a machine language version by Bob Christiansen called "Fastgammon." It plays differently than Scott's Basic game; same rules, but a distinct style of play. (By the way, these games are not to be confused with the type you get when you purchase a TRS-80. If I recall properly, the free tape I got with my machine did little more than act as an electronic/video board for two players who compete against one another. The games I'm talking about now play against you with the computer as your opponent.)

The games are similar in that the computer always plays by the rules and makes sure that you do too.

At the start of a game, each side has 15 men. The boards are divided into

BY KEN MAZUR

four quarters with each quarter having six points. The two quarters on the right side of the video are called the inner boards or home boards while the quarters on the left are known as the outer boards. The lower inner board is your home board and it is from there that you attempt to bear your men off.

Your men, the Xs, move counter-clockwise while the computer (the Os) moves in the opposite direction. Play of the men is based on the throw of two dice which is handled in both versions through random number generators.

For the opening throw, each player rolls a single die. A tie results in a second roll. The player that throws the highest number makes the first move using the count on the two dice. After the first move, each player in turn throws two dice.

A game is won by the player who first bears off all of his men. If your opponent has not borne off a single one of his own men, you win a Gammon, and you get a Backgammon if your opponent has not borne off a single man *and* has one or more men in your home board or on the bar.

Christiansen's machine language game offers two options after loading: 1, a new sequence of rolls; or 2, the same rolls as the previous game. If you're starting a new game, hit the "1." By selecting "2," you will get the same sequence of rolls that occurred in the game you just played. This is a handy feature if you want to see what the outcome of a game would have been had you played another way.

Entering moves is handled differently by the games. In Adams's game, all moves can be entered at the same time with periods separating the moves of individual men. For instance, in double fours 7-3.8-4.4-0-2 means move the man on point seven to point three; move the man on eight to point four; and move two men from point four to home. "Home" and "bar" in the Basic game are referred to as 0.

With the machine language game, a



Figure 1 - Basic Backgammon

| Opening Roll |    | Doubles |    | Remaining Men on Board |    | Winner |          |
|--------------|----|---------|----|------------------------|----|--------|----------|
| TRS-80       | Me | TRS-80  | Me | TRS-80                 | Me | TRS-80 | Me       |
| 2            | 4  | 1       | 3  | 6                      |    |        | X        |
| 1            | 4  | 1       | 3  | 10                     |    |        | X        |
| 4            | 3  | 5       | 1  |                        | 2  | X      |          |
| 3            | 4  | 2       | 3  |                        | 15 | X      | Gammon   |
| 4            | 5  | 5       | 5  | 13                     |    |        | X        |
| 1            | 2  | 7       | 0  |                        |    | 15     | X Gammon |
| 2            | 4  | 6       | 0  |                        | 7  | X      |          |
| 3            | 6  | 0       | 3  | 11                     |    |        | X        |
| 4            | 3  | 5       | 2  |                        | 9  | X      |          |
| 3            | 2  | 2       | 4  | 11                     |    |        | X        |
| 2            | 3  | 5       | 3  | 15                     |    |        | X Gammon |
| 3            | 1  | 6       | 2  |                        | 6  | X      |          |
| 1            | 6  | 3       | 1  | 1                      |    |        | X        |
| 5            | 1  | 4       | 4  |                        | 3  | X      |          |
| 4            | 3  | 3       | 5  |                        | 1  | X      |          |
| 6            | 4  | 4       | 5  |                        | 1  | X      |          |

single move is made before the computer accepts the next move. The men in this version also blink before and after being moved, making the shifts easier to spot. "Home" is "H" and the "bar" is "B."

Quality Software provides a small booklet as documentation. The booklet explains the rules of the game, how to play Fastgammon under those rules, display limitations, using Fastgammon to improve your game and recommend first moves. Of the two versions, the machine language Fastgammon is preferable. Adams's version is good for the novice who can use the slower speed of Basic to study the board and try to anticipate the machine's moves. After some degree of proficiency is attained, however, that same slowness begins to be irksome.

Both games served as valuable learning experience for me. Adams's Basic game is much slower than Christian-sen's machine language version, but it helped me learn what the game was about. I could try to anticipate what the micro would or should do while it was making its decision.

With the machine language tape, it's a fight for survival against a fast opponent but one that I am better able to deal with because I had the opportunity to learn the game from the slower, less intimidating Basic.

As many of my Backgammon playing friends would get upset being beaten by a machine, I decided to start logging statistics while I played. (My friends would fill the room with cries of "Cheat!" when either version rolled itself doubles but I never heard those cries when my friends were blessed with double rolls.)

In a 16-game tournament (spread over a month's time) against the Basic Backgammon, the results are shown in Figure 1.

In 25 games with the machine language "Fastgammon," the results were as given in Figure 2.

Basic Backgammon is priced at \$14.95 from Adventure International, Box 3435, Longwood, FL; (305) 862-6917.

Fastgammon costs \$19.95 on tape and \$24.95 on diskette. It is available from Quality Software, 6660 Reseda Blvd., Suite 103, Reseda, CA 91335; (213) 344-6599.

Figure 2 -Fastgammon

| Opening Roll |    | Doubles |    | Remaining Men on Board |    | Winner |          |
|--------------|----|---------|----|------------------------|----|--------|----------|
| TRS-80       | Me | TRS-80  | Me | TRS-80                 | Me | TRS-80 | Me       |
| 4            | 3  | 6       | 3  |                        | 12 | X      |          |
| 3            | 4  | 3       | 2  |                        | 2  | X      |          |
| 1            | 4  | 5       | 1  |                        | 12 | X      |          |
| 1            | 6  | 6       | 4  |                        | 11 | X      |          |
| 4            | 3  | 4       | 4  | 6                      |    |        | X        |
| 5            | 1  | 2       | 4  |                        | 11 | X      |          |
| 2            | 1  | 4       | 2  |                        | 7  | X      |          |
| 2            | 6  | 5       | 1  |                        | 2  | X      |          |
| 4            | 2  | 3       | 1  | 6                      |    | X      |          |
| 4            | 2  | 5       | 4  |                        | 8  | X      |          |
| 5            | 3  | 1       | 5  |                        | 2  | X      |          |
| 5            | 6  | 1       | 2  | 6                      |    |        | X        |
| 1            | 6  | 2       | 5  | 2                      |    |        | X        |
| 5            | 6  | 4       | 2  |                        | 15 | X      | Back-    |
| 3            | 4  | 5       | 2  | 5                      |    |        | gammon   |
| 6            | 3  | 5       | 2  |                        | 5  | X      |          |
| 1            | 2  | 2       | 3  |                        | 4  | X      |          |
| 2            | 4  | 2       | 3  |                        | 4  | X      |          |
| 5            | 6  | 1       | 4  | 12                     |    |        | X        |
| 4            | 3  | 1       | 3  | 7                      |    |        | X        |
| 4            | 6  | 2       | 2  | 8                      |    |        | X        |
| 6            | 2  | 1       | 5  | 14                     |    |        | X        |
| 5            | 1  | 9       | 1  |                        | 12 | X      |          |
| 4            | 1  | 2       | 2  | 4                      |    |        | X        |
| 5            | 3  | 3       | 5  | 15                     |    |        | X Gammon |



# WHAT'S COMING UP

## SYSTEMS

### Network System for Apple

Nestar Systems, Inc. has announced a new Clustershared personal computer system, Cluster/One, Model A (for the Apple). Up to 64 Apple II computers may be tied together in a local network. Users may communicate with one another, share data and access the same files, while the individual computer remains free to tackle accounting and scientific problem solving without being tied down by other computers in the system.

Professional and business offices as well as departments within large firms can use a Clustershared system, typically consisting of multiple Apple II computers, the Nestar Cluster/One, Model A, and shared resources such as printers, data recorders, plotters and graphics tablets. The system is compatible with the standard Apple DOS and Pascal systems.

With up to 33 MB of on-line storage in a single Model A, users may keep financial and operating records at their fingertips, access training programs or run statistical software. Memos and reports may be written, corrected, stored and "mailed" to any other users on the Clustershared system.

Beginning with as few as three Apples, users may at any time, expand to as many as 64 Apples in a single local network. Many peripheral devices may be added to any Apple in the system for either local or shared use.

You may use any peripherals supported by the Apple II from impact-type printers to speech recognition devices. To accommodate users' requirements, one Apple may be designated as the "printer station" hosting a check writer, plotter and high-speed printer.

The multiple Apple II computers maintain their independence. A failure on one Apple station in the system does not affect the others, and the Clustershared network is free to continue running.

The Nestar Model A consists of the central storage unit (a dual eight-inch floppy disk drive with optional 16.5 or 33MB hard Winchester disk). It also includes a Nestar ClusterBus communications card for each Apple station in the system, ClusterBus cables for station interconnects and Nestar's proprietary operating software.

In the ten-station systems, with the Nestar 1,260,000 byte dual eight-inch floppy disk storage unit, the per station cost is less than \$2800.

Price is \$6000 for the basic system with 1,260,000 bytes of storage. The optional 16.5 and 33 MB hard disk systems will cost \$8000 and \$10,000 respectively. A ClusterBus communication card, priced at \$400, is required for each user station on the network.

The cost of the Apple II personal computers are separate and must be added into the total network price. For more information contact Nestar Systems, Inc., 430 Sherman Ave., Palo Alto, CA 94306; (415) 327-0125.

*Circle No. 138*

### Leasing the TRS-80 Model II

You can lease a complete TRS-80 Model II Microcomputer System to help handle accounting and administrative functions required in running your business profitably. A&A Financial Corporation is offering a 36-month true lease, preceded by a 90-day warranty period.

The 90-day warranty permits you to evaluate the system and determine that the particular TRS-80 Model II system you select will handle your particular applications. If during the warranty period you choose to return the computer, you may do so and the lease is then cancelled.

The lease allows you to pay only for the use of the equipment. Payments do not apply towards ownership of the system, and you have no obligation to buy at the end of the lease term. You do have the option to buy, if desired, to continue leasing, or to move on to a larger, more sophisticated system. And, since this is a true lease, rental payments may be fully tax deductible as a business expense, the company said.

An additional benefit of the lease program is that the customer will be able to work directly with Radio Shack to answer questions on warranty claims, learn about the operation of the system or acquire other information needed about TRS-80 computerware.

Further information on leasing a Radio Shack TRS-80 Model II Microcomputer System is available from participating Radio Shack stores and dealers, and Radio Shack Computer Centers, or from A&A Financial Corporation, 800 Two Tandy Center, Fort Worth, Texas 76102. *Circle No. 143*

### Compact Computer System

A computer contained in a single compact cabinet is available from Chrislin Industries. Dubbed the CI-103, the unit is comprised of a DEC VT100 video terminal, LSI 11/2 or LSI 11/23 CPU and 64K bytes to 256K bytes of high speed memory housed in a single 14-1/2" high x 18" wide x 14-1/4" deep cabinet. The unit has a detached typewriter-like keyboard. Digital Equipments' full line of PDP 11 software is available. The DEC RX02 one megabyte floppy disk system or a ten megabyte cartridge disk system is offered as an option.

Single quantity price with LSI 11/2 and 64K bytes is \$4500; with the LSI 11/23 and 256K bytes, \$9600. Optional RX02 1 megabyte floppy disk system sells for \$3045; ten megabyte cartridge disk system, \$6100. For more information contact Chrislin Industries, Inc., Computer Products Division, 31352 Via Colinas #102, Westlake Village, CA 91361; (213) 991-2254. *Circle No. 149*

## PERIPHERALS

### 12" Video Monitors

Leedex Corp. has announced Video 100-80, a new 12" black and white monitor for industrial use. It includes a



## WHAT'S COMING UP

rugged metal cabinet.

The removable face plate provides mounting space for a mini floppy disk. There is also space inside the cabinet for an 11" x 14" PC board for custom designed controller electronics.

The picture tube allows an 80 character by 24 line display with crisp, well-defined characters. Vertical and horizontal hold, contrast brightness and power are front-mounted for easy access.

The monitor has an off-white cabinet with black face plate plus plug-in compatibility with Apple, Atari, Radio Shack, O.S.I., Microterm and Exidy. Price is under \$200. For more information contact Leedex Corp., 2300 E. Higgins Rd., Elk Grove Village, IL 60007; (312) 364-1180. *Circle No. 141*

### Bidirectional Printer

A Harris 120 character-per-second bidirectional 3165 printer has improved medium-volume throughput for Harris' 8000 interactive terminal systems, said the company. The bidirectional print head seeks the shortest path to the next line of data, enabling the 3165 to sustain its high throughput rate.

The 3165 printer is the fifth optional printer available with Harris' 8000 interactive terminal systems. The printer is available in two models: one uses a 7x7 dot matrix which

prints 64 ASCII or EBCDIC uppercase characters; the other prints 96 uppercase and lowercase ASCII and EBCDIC characters using a 7x9 dot matrix.

Other features include an automatic motor switch, electronic vertical forms control, form feeding from rear or bottom and an optional printer stand.

The 3165 can accept paper widths up to 17.3 inches and prints on forms of as many as six parts. It is suited for a variety of local printing applications with Harris' 8000 interactive terminal systems.

Horizontal spacing is ten characters per inch in line lengths of 132 characters. Vertically, the printer prints six lines per inch with a paper slew rate of eight inches per second.

Price for the printer is \$4650. Leasing and maintenance plans are available. For more information contact Harris Corp., P.O. Box 400010, Dallas, TX 75240; (214) 386-2534. *Circle No. 153*

### Expansion Interface for TRS-80

An enhanced expansion interface for the TRS-80 has been announced by Lobo Drives. The Model LX80 interface was designed to improve and expand the performance and capabilities of the TRS-80. It offers several new features not available on the standard Radio Shack model.

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#### TRS 80 MODEL I

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| 4 K LEVEL I SYSTEM                | \$499.00   | \$464.10  |
| 4 K LEVEL II SYSTEM               | \$619.00   | \$575.70  |
| 16 K LEVEL II SYSTEM              | \$849.00   | \$789.60  |
| EXPANSION INTERFACE (16 K Memory) | \$299.00   | \$278.10  |
| TELEPHONE MODEM                   | \$199.00   | \$185.10  |

|                                     | LIST PRICE | OUR PRICE |
|-------------------------------------|------------|-----------|
| CENTRONICS 730                      | \$995.00   | \$695.00  |
| CENTRONICS 737                      |            |           |
| • 100 CPS                           |            |           |
| • LETTER QUALITY DOT MATRIX         |            | \$950.00  |
| • TRUE DESCENDERS                   |            |           |
| NEC SPINWRITER 5530 (with Tractors) | 3195.00    | 2950.00   |

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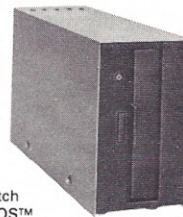
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## WHAT'S COMING UP

The Model LX80 expands memory storage capacity up to 40 million bytes. It provides facilities for up to 32K of RAM and offers a second serial port.

Connectors for the 5.25 and 8-inch floppy disk drives and other peripheral devices are conveniently located on the side and rear panels. There is a separate, bidirectional parallel port exclusively for the Lobo Drives Model 7710T Winchester hard disk drive.

Other features include: a parallel Centronics printer port, screen printer port, two microprocessor-controlled bidirectional serial ports and a crystal controlled real-time clock.

Model LX80 Expansion Interface is priced at \$525 and shipment is 45 days ARO. For additional information, contact Mike Mock, Lobo Drives International, 935 Camino Del Sur, Goleta, CA 93017; (805) 685-4546 or (714) 641-1436. *Circle No. 144*

### Serial Printer Price Reduced

Tally Corporation has reduced prices on its Model T-1602 serial printer from \$2645 to \$1995. Prior price reductions were made on Tally teleprinters and M-series serial printers.

The T-1602, which offers microprocessor controlled optimized bi-directional printing for increased throughput, is a quiet, desk top, 132-column impact matrix printer designed for high volume data processing applications. T-1602 fea-

tures dual sprocket feed tractors for positive paper positioning and fast paper advance. The tractors adjust from either side of the carriage and handle multi-part forms from four inches to 15 inches wide.

A 7 × 7 half space dot matrix font produces highly legible, sharply defined characters. Standard features include a 96 character upper/lower case character set, self test, forms length selector, forms thickness control, paper out alarm, double wide character printing and a snap-in ribbon cartridge inking system.

For more information contact Frank Batchelor, Tally Corporation, 8301 S. 180th St., Kent, WA 98031; (206) 251-5524. *Circle No. 150*

### Disk-Stored Data Protection

The Computer Service Systems Network Backup subsystem is a complete hardware and software package for the protection of disk-stored data. The off-line storage medium is 13.4 Mbyte capacity magnetic tape cartridge, making Backup suitable for use with high-capacity Winchester disks.

Statistics from large time-sharing operations indicate most disk errors are operator induced, involving individual files rather than the entire disk. Earlier bit-stream backup devices saved and restored entire disks, meaning that an error in one file could only be corrected by replacing all the files on that

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**SPACEBATTLES** — High-speed graphics (machine language sub-routines). You are the commander of a small mercenary star-cruiser. You have been hired to destroy a fleet of alien invaders. If you survive, you will be handsomely rewarded; if you lose, you're dead. **cass./\$14.95 disk/\$19.95**

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**SUPER MULT** — (ages 8 to adult) Contains 25 learning modules to learn and improve multiplication facts. Problems can be timed or untimed. **cass./\$24.95**

**\*Call in orders SPECIAL \$18.95**

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computing, February 1980.

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80 Software Critique, Issue #2.

#### SUPER MULT —

"Very comprehensive multiplication program . . . suitable for use by students just learning the multiplication

tables and for adults that need some brushing up." — 80 Software

Critique, Issue #2.

#### FINAL APPROACH —

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— Creative Computing, January 1980.

**SPACE BATTLE** — "The unique value of Space Battle lies in the extra dimensions of the game . . . What is tough is staying alive . . . In short, this is a challenging game with a lot of factors to create interest . . . One of the best space war games available." — 80-US, Mar/Apr 1980.

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## WHAT'S COMING UP

disk and thus losing all work since last backup. Backup's file-by-file operations allow you to restore just those files lost.

Backup comes with a Z-80A and S-100 interface board, a DEI cartridge tape drive and a CP/M-compatible software utility, featuring the file-by-file Save and Restore commands. The entire package, in one compact rack-mountable unit, is available now for \$2995 from CSSN. For more information contact CSSN, 120 Boylston St., 4th Fl., Boston, MA 02116; (617) 482-2343. *Circle No. 146*

## SOFTWARE

### Sink the Bismarck with your Apple

*Computer Bismarck*, a historical simulation game of the British attempt to find and sink the German battleship Bismarck in 1941 has been announced by Strategic Simulations, Inc. The game is played on an Apple II computer with an Applesoft firmware ROM card or an Apple II Plus and requires 48K memory and a minifloppy disk drive.

*Computer Bismarck* features a high resolution color graphics mapboard of the North Atlantic and can be played by one or two players. The solitaire game pits a British player against the computer as the German commander. The two player version allows one player to command the British Home Fleet while the other player commands the German Kriegsmarine. Players take turns moving their battleships, cruisers, aircraft carriers, destroyers, submarines, convoys, oilers and aircraft across the North Atlantic. Only enemy units which are spotted are revealed to the players. Rules cover all of the critical aspects of the naval campaign, from weather to ship fuel capacities. Combat occurs when opposing units have spotted each other.

Complete with program disk, rule book and seven player aid charts, the program can be purchased for \$59.95. Contact Strategic Simulations Inc., P.O. Box 5161, Stanford, CA 94305. *Circle No. 134*

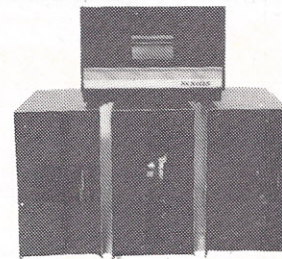
### CP/M Business Software

Univair, Inc., has released its third generation of specialized business software. Named the Series 8000 line, it has been written especially for CP/M oriented microcomputer systems with eight-inch disk drives, as well as the 64K TRS-80 Model II.

Featured are a Medical Management System, Dental Management System, Real Estate Multi-List, Insurance Agency, Legal Time Accounting, General Ledger, Accounts Payable, Accounts Receivable, Payroll and inventory. All programs are written to run in 32K of RAM using the latest version of CBasic-2 with its instantaneous chaining routines, common statements and memory overlay techniques. All file creations, backups, sorts, merges and returns to the main screen are performed automatically with no operator input whatsoever. All programs can be run independently or can be

## SAVE ON ADD-ON PRODUCTS FOR TRS-80

The largest family of disk drives from the largest supplier, drives come complete with power supply and cabinet.



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| MTI-40 Disk Drive, 35 & 40 track .....                | \$369 |
| TF-1 Pertec FD200, 40 track, use both sides .....     | \$389 |
| TF-3 Shugart SA400, 35 track, same as handy .....     | \$389 |
| TF-5 MPI B51, 40 track .....                          | \$379 |
| TF-70 Micropolis, 77 track with 195K of storage ..... | \$639 |
| TDH-1 Dual sided drive, 35 track .....                | \$499 |

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## NEW PRODUCTS

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|-------------------------------|---------|
| 16K Memory .....              | \$86    |
| Modem .....                   | \$179   |
| Expansion Interface 32K ..... | \$499   |
| AC Isolator .....             | \$47.95 |

## PRINTERS

|                                       |        |
|---------------------------------------|--------|
| DP800 Anadex, 80 column, 112cps ..... | \$949  |
| LP779 Centronics 779 .....            | \$1099 |
| LP730 Centronics 730 .....            | \$950  |
| LP700 Centronics 700 .....            | \$1395 |
| LP701 Centronics 701 .....            | \$1759 |
| LP702 Centronics 702 .....            | \$1995 |
| SPW-1 Spinwriter-NEC .....            | \$2525 |

## NEW! LINE PRINTER BASE 2

Base 2 Printer 80, 132 col., graphics  
60 LPM with tractors ..... **\$599**

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### MOD II DISK DRIVES NOW AVAILABLE

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| Pertec FD200 .....             | \$282 |
| Pertec FD250 (dual head) ..... | \$399 |
| Shugart SA400 (unused) .....   | \$286 |
| Shugart SA800 .....            | \$479 |
| MPI B52 .....                  | \$349 |
| B51 .....                      | \$279 |

## SOFTWARE

|                                                                          |         |
|--------------------------------------------------------------------------|---------|
| Disk Drive Motor Speed Test .....                                        | \$19.95 |
| New DOS+ with over 200 modifications and<br>corrections to TRS-DOS ..... | \$99    |
| New DOS+ 40 track .....                                                  | \$110   |
| AJA Word Processor .....                                                 | \$75    |
| AJA Business Program .....                                               | \$250   |
| Racet Infinite Basic .....                                               | \$49.95 |
| Disk Drive Alignment Program .....                                       | \$109   |
| Radix Data Base Program .....                                            | \$99.95 |
| Electric Pencil .....                                                    | \$150   |

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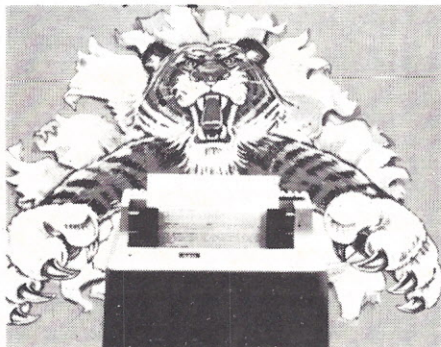
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- Up to 198 characters per second
- 132 columns
- 6 or 8 lines per inch
- Eight software selectable character sizes
- 1.75" to 9.5" adjustable feed.
- Parallel (Centronics) and serial interface.

Includes Graphics (New low price) ..... \$ 949  
Best quality cables for TRS-80 & Apple, In stock ..... \$ 39

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CIRCLE 33

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| ★ Municipal Budgetary Accounting      | ★ |
| ★ Balance-Forward Accounts Receivable | ★ |
| ★ Open-Item Account Receivable        | ★ |
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| ★ Accounts Payable                    | ★ |
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CIRCLE 34

## WHAT'S COMING UP

automatically interfaced to the General Ledger at the end of the month for automatic postings of activity into the appropriate journal accounts.

New features include optional default of current date for all tickets and reports, carriage-return defaults for all editing functions, clients name displayed when entering tickets and payments, combined ticket and loading routines, automatic display and computation of normal office charges, improved scheduling routines, alphanumeric client sorting and archiving, new main-screen link to interface quickly to large time-sharing databases through a telephone modem, provisions to link special user-developed programs into the main menu, general user improvements and newly-designed detailed operators manuals.

Series 8000 systems are priced at \$495 each, which includes telephone consultations for end-users during initial setup. Series 2000 system owners may upgrade their programs at a cost of \$100 each. Operators manuals may be purchased separately for \$15 each, and a Master Software Directory, available at \$5, indexes hundreds of additional other programs which will run under CP/M and TRS-DOS.

For more information contact Univair, Inc., 10327 Lambert Intl. Airport, St. Louis, MO 63145; (314) 426-1099. Circle No. 102

### Educaton Software for the Apple Designed for Elementary Students

The "Speller-Box," a small black box that plugs into the same I/O on your Apple II and allows you to start and stop a cassette tape player under program control, is available from Hartley Software.

Speller-box gives spelling tests with the Apple, presents music lessons or any type or aural presentation a teacher desires while allowing the student to interact through the keyboard.

Over seven programs have been developed to be used with the box and incorporate large characters for lower elementary grades. Also available is a clock tutorial program for teaching time. All programs were designed by elementary teachers and have been classroom tested.

The company offers a free catalog and descriptions of each program. Cost of the Speller-Box with one program is \$49.95. Individual programs are \$19.95. For more information contact Hartley Software, 3268 Coach Lane #2A, Kentwood, MI 49508; (616) 942-8987. Circle No. 108

### On-Screen List Maker for the 16K TRS-80

The Listmaker, from Manhattan Software, is designed for the TRS-80 owner who wants maximum name-and-code listing capacity, program flexibility within a 16K memory limitation and tape-only storage.

Up to 400 names or items with codes can be entered into memory, with 5-digit codes (numbers, letters or mixed) to



## WHAT'S COMING UP

allow detailed identification of groups of names. The program will list all names on screen or to a printer, list names in a specific 5-digit code, or by first digit only, first two, three or four digits.

Listmaker sorts names alphabetically, finds and displays any name for review, editing of name or changing code, or deletion and memory recovery. It saves to tape and loads lists from tape.

Suggested applications are for clubs, organizations, small businesses or individuals who want to retrieve selected lists by specified code from a large listing of names. Other uses include listing of books, records and other items by category.

For TRS-80 Level II 16K, the program costs \$9.95. For more information contact Manhattan Software, Inc., P.O. Box 5200 Grand Central Station, New York, NY 10017; (212) 534-2758. *Circle No. 111*

## DOS for Apple II Similar to CP/M

The Optimized Systems Software Group of Shepardson Microsystems has announced a disk-based operating system package for the Apple II. The package consists of CP/A (Control Program/Apple) including a set of disk utility commands similar to those of the 8080-based CP/M with Basic, text editor, assembler and 6502 debug programs.

CP/A is the console interface to an operating system which provides the user with a device independent interface to physical and/or logical I/O devices. The devices communicate with the operating system via OSS supplied and/or user written device handlers.

The OSS Disk File Manager Device Handler provides for sequential and random data access along with file management functions such as Rename, Erase and Protect. Disk file names are of the "primary, secondary" type and may contain the wild card search characters "\*" and "?".

A typical example of the OSS system is the statement: PRINT #1, "HELLO". The "HELLO" string may be sent to the disk, a printer, a modem or any other device opened as file #1. Program lines are checked for correct syntax as they entered. Decimal floating point arithmetic, 32K character strings and long (128 character) variable names are some of the other features of OSS Basic.

The OSS text editor is used primarily for developing program source for the assembler; however, it may be used for editing Basic programs and any other text. The assembler uses the MOS Technology defined 6502 mnemonics and operands. Assembler object code may be placed directly into memory, or may be sent to any device. The debugger allows for interactive machine level debugging with command functions such as step, trace, dis-assemble and memory move.

The software package may be purchased for \$89.95. CP/A with Basic is \$49.95. CP/A with the editor, assembler and debugger is \$49.95. Future OSS products will include a machine language data base manager. For further information, contact R.C. Shepardson, 20823 Stevens Creek Blvd., Building C4-H, Cupertino, CA, 95014; (408) 257-9900.

*Circle No. 104*

## DYNACOMP

Quality software for: Apple II Plus  
TRS-80 (Level II)  
North Star

All software is supplied with complete documentation which includes clear explanations and examples. Each program will run with standard terminals (32 characters or wider) and within 16K program memory space. Except where noted, all software is available on North Star diskette (North Star BASIC), TRS-80 cassette (Level II) and Apple cassette (Applesoft BASIC). These programs are also available on PAPER TAPE (Microsoft BASIC).

### FLIGHT SIMULATOR

(as described in SIMULATION, Volume II)

Price: \$17.95 postpaid

A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobic maneuvers.

SIMULATION, Volume II (BYTE Publications): \$6.00

### VALDEZ

Price: \$14.95 postpaid

A simulation of supertanker navigation in the Prince William Sound and Valdez Narrows. The program uses an extensive 256X256 element radar map and employs physical models of ship response and tidal patterns. Chart your own course through ship and iceberg traffic. Any standard terminal may be used for display.

### BRIDGE 2.0

Price: \$17.95 postpaid

An all-inclusive version of this most popular of card games. This program both BIDS and PLAYS either contract or duplicate bridge. Depending on the contract, your computer opponents will either play the offense OR defense. If you bid too high the computer will double your contract! BRIDGE 2.0 provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice.

### HEARTS 1.5

Price: \$14.95 postpaid

An exciting and entertaining computer version of this popular card game. Hearts is a trick-oriented game in which the purpose is not to take any hearts or the queen of spades. Play against two computer opponents who are armed with hard-to-beat playing strategies.

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This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

### FOURIER ANALYZER

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Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

### MAIL LIST I

Price: \$18.95 postpaid (available for North Star only)

A user-featured mailing list program which searches through your customer list by user-defined product code, customer name or Zip Code. Entries to the list can be conveniently added or deleted and the printout format allows the use of standard size address labels. Each diskette can store more than 1000 entries.

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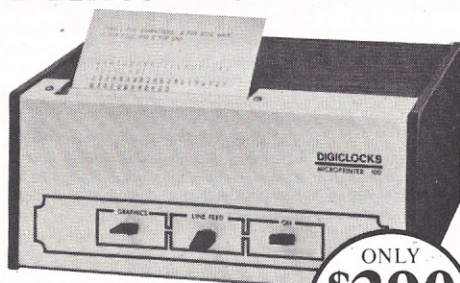
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CIRCLE 36

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CIRCLE 37

## WHAT'S COMING UP

### Graphics Software

HSC Computer Services, Ltd., has announced Plotter a software product which turns any microcomputer that operates under the CP/M operating system and uses CBasic-2 into a graphics output station, said the company.

The user may direct output to the console terminal or the printer. Output consists of an X and Y axis plot of coordinate pairs. The graph title and X, Y axis titles are entered by the user. Plotter reads an output coordinate file either produced by the user's CBasic-2 application program or by entering X, Y data points into supplied data entry program. If coordinate data is entered, it is then output to a diskette data file for processing. Plotter reads in this data, automatically scales it for optimum fit and plots it on a coordinate grid with labeled axes and graph title.

Plotter may be used for graphically displaying data visually for business, sales presentations, educational demonstration and display sales versus time. It is available on North Star mini-floppy diskette and on large 8-inch diskette. Plotter requires 40K of memory and either a hardcopy terminal or printer is recommended. The output is standard 8-1/2 x 11.

Price is \$35, including Plotter diskette with instructions and sample data file. Plotter is available from stock. For more information contact HSC Computer Services, Ltd., P.O. Box 43, Brooklyn, NY 11236; (212) 780-0022.

Circle No. 126

### TRS-80 Level II and DOS Software

International Data Services, (IDS), a software supplier for large mainframe users, has entered the small computer software market.

All IDS TRS-80 software is supplied on high quality cassettes and retails for either \$3.95 (standard) or \$7.95 (deluxe). Standard editions are supplied with instructions included in the program or in a separate file on side B of the cassette. Backup copies of each file immediately follow the file. Deluxe editions come with printed instructions, have a backup copy on side B and identical labels on each side.

For Level II with 16K or Disk Basic with 32K, IDS offers Microsketch III which includes graphics drawing, automatic pattern drawing, graphic string creation, big print and automatic circle drawing. Easily created graphic screens may be saved in memory on tape, in disk or incorporated into other programs. In addition to the main system's 51 commands, each of five subsystems has its own set of commands. Nine pages of documentation are included. Order by catalog #SKETCH3/BAS for \$7.95.

For Level II with 4K or Disk Basic with 16K, IDS offers Freakout, which includes keyboard generated graphics and sound, for ages one and up. Every key or combination of keys produces a different graphic pattern and corresponding sound pattern. The more keys that are pressed simultaneously, the wilder the effect, said the company. Sounds are produced from the "Aux" cassette output. Order by catalog #FREAKOUT/BAS for \$3.95.

Number Base Conversion converts any base to any other base between 2 and 16. For \$3.95.



## WHAT'S COMING UP

For Disk Basic with 16K there is Basic to Electric Pencil File Conversion. This program converts any Basic program or data file to an Electric Pencil file automatically, said IDS. Use it under any version of TRSDOS or NEWDOS. Order catalog #PCLCONV/BAS. Price is \$3.95.

Machine language to Basic Data Statement Conversion automatically converts a machine language program located anywhere in memory to a disk file of Basic Data statements which may be merged into any basic program, so that the machine language program may be "POKED" from Basic. This program eliminates the need to load machine language programs separately. Starting and ending addresses may be specified in either decimal or hex. Order catalog #DATAConv/BAS. Price is \$3.95.

Mail List File — All Upper to Upper/Lower Case Conversion automatically converts your mailing list to upper/lower case once your lower case conversion kit is installed. Mail list may be contained in any ASCII file including an Electric Pencil file. Output file, also Electric Pencil compatible, takes format and context into account to convert state and other abbreviations correctly. The first line of each name and address may optionally be ignored as in the case of a coded list. Order by catalog #MLOWCNV/BAS for \$3.95.

For more information contact International Data Services, 340 West 55th St., New York, NY 10019; (212) 765-8610. Circle No. 132

## Fantasy Simulation Game

Castle, a fantasy simulation game in which the player searches for treasure in a magical world, is now available in North Star disk Basic (version 6 or later). The game provides descriptions of the locations, objects and situations encountered by the adventurer, and accepts English-like commands from a vocabulary of over 150 words.

Castle requires a system with 32K bytes of memory and a single or double density North Star disk drive. Price is \$16.95, including manual and disk. For more information contact International Computing and Robotics, 4920 Harmony Way, San Jose, CA 95130. Circle No. 135

## Word Processing for TRS-80

WordMagic II, a word processing program designed specifically for the TRS-80 Model II, has been announced by CalData Systems. Features include total TRS file compatibility, full cursor control, full edit capability, paging, printing, automatic page number insertion, documents up to diskette capacity, variable margins and tab stops.

Text may be entered without hitting the Enter key. WordMagic II automatically moves words that overflow the right margin to the next line. Smooth, ragged right, centering, mailing lists and automatic generation of a table of contents are included.

Price is \$100 including the manual, which is also priced separately at \$20 (California residents add 6% sales tax). For more information contact CalData Systems, P.O. Box 178446, San Diego, CA 92117. Circle No. 129

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CIRCLE 38

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CIRCLE 39



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CIRCLE 40

## WHAT'S COMING UP

### Application Development System for TRS-80

The Software Firm, Inc., is offering a system for the TRS-80 Model II user that integrates application development all the way from a professional operating system through database management and documentation.

The Advanced Application Development System, includes a data base handler, display control monitor, indexed sequential file support, advanced executive language, high speed basic compiler/interpreter, commercial-level operating system, documentation support and other features.

In use for several years on other Z-80 based systems, this system has reduced average development time by over 50%. The applications developed can range from the simplest of list-keeping systems to full multi-user based systems.

Device independence expands the hardware options available for the Model II by providing for straight-forward incorporation of devices that Radio Shack does not support.

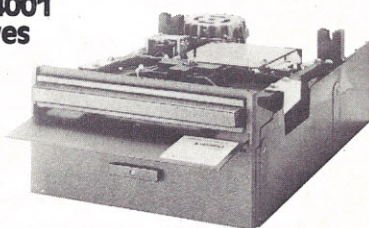
The Basic Compiler/Interpreter is more powerful than the Basic provided with the Mod II, the company said. Programs may be developed utilizing the Basic interpreter and then compiled for further space savings and speed improvements. Compilation also eliminates the need to distribute source code. Indexed sequential files as well as sequential and direct files are supported as an integral part of Basic.

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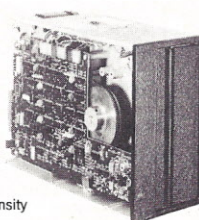
#### AVAILABLE OPTIONS/ACCESSORIES

☐ Single Drive Power Module, \$119.95 ☐ RFD4000 Manual, \$5.95 ☐ Drive Cabinet, \$29.95  
☐ Dual Drive Power Module, \$139.95 ☐ Interface Manual, \$2.95

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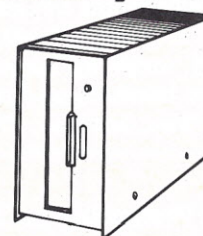


#### AVAILABLE OPTIONS/ACCESSORIES

☐ Door Lock, \$19.95 ☐ Connectors, \$9.95 ☐ Interface Manual, \$2.95  
☐ Write-Protect, \$19.95 ☐ Drive Cabinet, \$29.95 ☐ 1000B Technical Manual, \$5.95  
☐ Interface Adapter (Remex to Shugart), \$12.95

### SIRIUS 80plus Series . . . perfect add-ons for your TRS-80\*!

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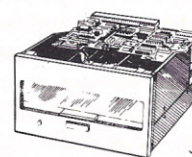
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CIRCLE 41



## WHAT'S COMING UP

The database handler Datamaster provides capabilities for defining, creating, loading, editing, maintaining and documenting application data files.

Datamaster field attributes include: auto-incrementing, must enter, non-display, left-zero fill, right space fill, default value, minimum number of characters and coded menus. Datamaster user functions include: duplicate from record, alter any field in record during entry, change field attributes, blank rest of fields and out, accept default value and backup to previous field.

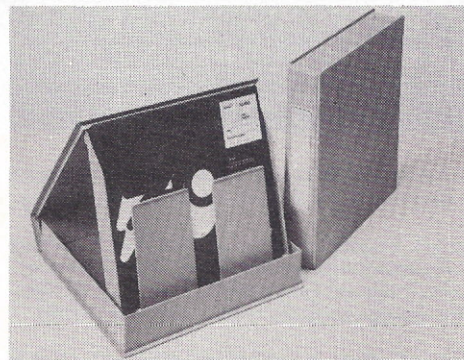
A subset of Datamaster, Monitor, is designed to be incorporated as a front-end for other programs developed. Monitor is a screen manager that performs data entry, editing titling and menu creation/update functions.

Script, a text output processor, assists in documentation preparation. It features chapter breaks, up to four section levels, pagination, titling and other formatting capabilities. A table of contents can be automatically self-generated from the document. The table of contents capability can also serve as a project organizer by producing outlines for both initial system design and documentation.

Price is \$595 for the Operating System, Datamaster, Monitor, Basic and Script. Other components individually priced. For more information contact The Software Firm, Inc., PO Box 6267, Denver, CO 80206; (303) 778-7473.

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\*Sort timings shown below are nominal times. Times will vary based on sort and system configurations. Nominal times based on Mod I 48K 4-drive configuration, 64 byte records, and 5 sort keys.

| TYPE | FILE SIZE<br>(Bytes) | SORT TIME<br>(Sec) | TYPE                | FILE SIZE<br>(Bytes) | SORT TIME<br>(Sec) |
|------|----------------------|--------------------|---------------------|----------------------|--------------------|
| SORT | 16K                  | 33                 | SORT                | 340K                 | 1081               |
| SORT | 32K                  | 49                 | SORT                | 680K                 | 2569               |
| SORT | 85K                  | 173                | SORT and 85K SORT + |                      | 1757               |
| SORT | 170K                 | 445                | MERGE               | 1275K Merge          |                    |

**DSM for Mod I (Minimum 32K, 2-drives) \$75 On-Disk**  
**DSM for Mod II (Minimum 64K, 1-drive) \$150 On-Disk\*\***

**Mod II Development Package \$100\*\***

Machine Language SUPERZAP, plus Editor/Assembler and Disassembler patches.

**Mod II Generalized Subroutine Facility 'GSF' \$50\*\***

\*\*For Mod II Programs, Include Mod II DOS diskette with order For Development Package, also include copy of Apparatus NEWDOS + 5¼ diskette.

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CIRCLE 43



ANNOUNCING

## PEOPLE'S PASCAL PROGRAM DEVELOPMENT SYSTEM FOR TRS-80

'Tiny' Pascal, runs on any 16K Level II system, includes the programming structuring capabilities of full Pascal, but not data structuring.

Compiled People's Pascal programs run about five-times faster than Level II Basic—graphics run eight-times faster. Tape 3 compiler written in Basic, requires T-Bug and Edit-Assmblr, compiles Z-80 code. Tape 6 runs in machine language, compiles faster, interprets P-codes.

|                                                    |         |
|----------------------------------------------------|---------|
| People's Pascal tape 3, compiles machine code      | \$15.00 |
| People's Pascal tape 6,.....                       | \$23.00 |
| Tape 1 Lev. II, 34 business, educational programs  | \$7.50  |
| (lev. I version avail., 24 programs—separate tape) |         |
| Tape 2 Lev. II, 77 programs from Osborne book,     |         |
| "Some Common Basic Programs                        | \$7.50  |
| Tape 4 Lev. I, 21 misc business and educational    | \$7.50  |
| Tape 5 Lev. II, 24 business, educational programs  | \$7.50  |
| Tape 7 Lev. II, 31 misc. business and educational  | \$7.50  |

Add \$.50 each tape for postage and handling.  
California residents add 6 pct. tax. Dealer inquiries invited.

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CIRCLE 44

## WHAT'S COMING UP

### Line Printer Spooling Facility

LPSPool, a line printer spooling facility for the TRS-80 Model I, has been announced by Automated Resource Management, Inc. LPSPool permits concurrent printing in the foreground while normal TRSDOS operation continues in the background.

A multi-tasking monitor permits switching between foreground and background processes. The despooler accesses spool files through a queue which may be generated by a utility program or automatically by the spooler. A separate spool and despool queue is maintained by the system. Each queue entry allows the specification of spool filename, number of copies, form type, whether the file is to be printed immediately, and whether the queue entry and/or file is to be deleted after printing.

A two-disk 32K or 48K byte system is required to support the 3K assembler program.

Price is \$39.95 on diskette and includes a 32K version, a 48K version, a queue maintenance utility, a demonstration program which leads the user through LPSPool's facilities and a comprehensive user manual. For more information contact Automated Resource Management Inc., P.O. Box 4353, Irvine, CA 92716; (714) 963-2975.

Circle No. 161



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VISA

CIRCLE 45



## WHAT'S COMING UP

### Accounts Receivable/Invoicing for TRS-80

Accounts Receivable/Invoicing System for the TRS-80 Model II is now available from Taranto and Associates, Inc.

This system features an open item accounting system. Service charges may be calculated at user option and up to 51 items may be billed on a single invoice. The statement is printed as well as the actual invoice.

The software is an on-line interactive system. Customer and invoice files are key controlled and immediately accessible. The system extends a line item, totals and computes sales tax if applicable. It also maintains a file of term descriptions for ease of entry. Each customer has pre-defined sales tax rate and terms code. An invoice can be entered at any time: before it is ready for billing, when it is ready for billing, after it has been billed, and even after it has been paid.

The Osborne/McGraw-Hill Accounts Payable/Accounts Receivable Wang Book documents a major portion of the system. You should have a copy to properly use the Accounts Receivable/Invoicing System, said the company. If you don't already have one, Taranto can supply it for \$20.

System price is \$249.95. For more information contact Taranto and Associates, Inc., P.O. Box 6073, 4136 Redwood Hwy., San Rafael, CA 94903; (415) 472-2670.

Circle No. 158

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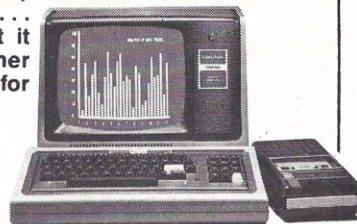
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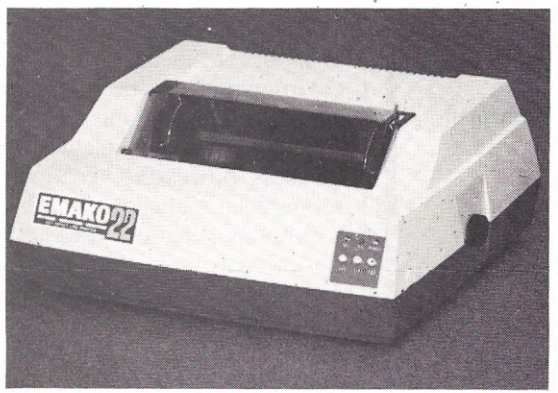
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CIRCLE 46

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## WHAT'S COMING UP

### Eliza for the TRS-80

"Eliza", an exercise in the simulation of artificial intelligence, is now available from Radio Shack for use on their TRS-80 microcomputer.

Ever since the advent of the computer, attempts have been made to create a thinking computer that could converse in everyday English, understand what is said and respond to statements with thoughts of its own, the company said.

Eliza was "born" in 1966 when an expert in artificial intelligence simulation at MIT, Dr. Joseph Weizenbaum, created a computational procedure that allowed a computer to analyze conversational English, respond to questions, and carry on a "conversation" with the person at the keyboard.

Designed for use with a Level I or Level II Model I TRS-80 Microcomputer System having 16K RAM, the program cassette also includes Talking Eliza, which permits Eliza to "speak" through a TRS-80 Voice Synthesizer.

The program is available from participating Radio Shack stores, dealers and computer centers for \$14.95. Contact Radio Shack, A Division of Tandy Corp., 1300 One Tandy Center, Fort Worth, TX 76102; (817) 390-3272. Circle No. 110.

### Hayden Has Openings for Microcomputer Software Specialists

Hayden Book Company in Rochelle Park, N.J. is expanding its software operation immediately and is interviewing for three microcomputer software product managers to assist in the acquisition and development of products in these areas:

- Business Applications
- Entertainment (Games and other amusements)
- Education (Schools and Universities)

If your interests and experience are appropriate, please send a vita/resume to:

Bill Cook, Editorial Director  
Hayden Book Co., Inc.  
50 Essex Street  
Rochelle Park, N.J. 07662

### Word Processing for Office Automation

Wordform, a word processing application program for the Microterm II Desktop Distributed processor making it applicable to the office automation environment, has been announced by Digi-Log Systems, Inc.

Capabilities now include Basic for business processing, communications for remote application processing and word processing for office automation, the company said. Designed for business personnel to perform their daily office requirements, Wordform implements letter writing, filing, editing and printing. It also creates a mailing list that allows you to selectively merge names and addresses into a letter. Letters and documents are stored on diskette (floppy disk) can be retrieved and edited with minimum effort.

Wordform uses simple, single-word,



## WHAT'S COMING UP

English language commands to initiate the execution of specific tasks. Through these commands, you can create, maintain and manipulate files. User-assigned file names allows you to manipulate individual files. Once edited, the files can be output to the printer to produce printed copies.

Wordform organizes a page into 72 lines, equivalent to a 12-inch sheet of paper, printed with conventional 6 lines/inch vertical spacing. Any 24-line page segment is displayable, and the entire page can be scrolled up or down past the screen as if the screen was a window to the observer. Individual keys are used to scroll through a page, page forward or backward, perform tab functions, center text, perform left and right justification, append, delete or insert a 24-line page segment and search for defined strings of text.

Wordform also prints the letter or document after it has been entered and edited. Any number of copies can be printed, and you can specify the pages to be numbered and titled. You can also merge data from a specified file into the printed copy. Wordform allows you to create your own mailing list and to print your own labels via its mailing list routine.

Wordform is included in Digi-Log's Multi-Task operating system for \$50. For further information contact Robert Roth, Division Manager, Digi-Log Systems, Inc., Babylon Road, Horsham, PA 19044, (215) 672-0800.

Circle No. 107

### Disk Operating System

InfoSoft Systems, Inc., has introduced I/OS Disk Operating System for 8080, 8085 and Z-80 disk-based CPUs. I/OS is an upgraded version of the company's former TSA/OS Disk Operating System, said the company.

I/OS may be tailored for each hardware configuration on which it is used. InfoSoft Systems makes available an extensive pretested library of terminal, device and disk driver modules, said the company.

The system is designed for use with both large hard disks and floppy disks, and has a file capacity exceeding 268 million bytes. Another capability is

printer spooling, which allows the printing of a disk file at the same time as other operations are performed.

Among other features are autostart capability and the ability to disable user abort sequences, along with many utilities including a symbolic debugger, a text editor, directory status, disk copy and file transfer programs, disk and memory diagnostics and a printout formatting facility.

I/OS Version 3.00 is compatible with the CDOS 02.00 operating system from Cromemco, Inc. The CDOS is based on InfoSoft Systems' formerly marketed TSA/OS system. I/OS is also compatible with Digital Research's CP/M Versions 2.0 and earlier.

The I/OS package will be available through microcomputer dealers in the US, Canada, Europe, South America and Australia for a retail price of \$150. For more information contact InfoSoft Systems, Inc., 25 Sylvan Rd. S., Westport, CT 06880; (203) 226-8937.

Circle No. 114

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CIRCLE 25

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CIRCLE 49



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CIRCLE 51

**WHAT'S COMING UP**

**Report Writer**

The Report Writer, designed for compiling information into a ledger sheet, is available from Carolina Business Computers.

Report Writer can be thought of as a matrix of rows and columns. Each element in the matrix may contain a literal string (title), a number or a function (calculated number). Any element may be functionally related to other elements; for example, element B5 may be equal to B3 divided by B2. In addition, functions on a row or column can be replicated. An example would be a sales figure that begins in January and increases ten percent each month through December.

Report Writer revolves around two operations; format definition and data entry. A reporting format must be machine memory resident prior to data entry. A previously generated format may be recalled off of disk or a new format may be initialized and then queried, changed or saved back to disk. Initialization of the format includes defining rows and columns; indicating whether or not a column entry will default to a literal string; decimal or integer number; defining the length of each column; and whether or not dollar signs, commas or the percentage sign can be included in the hard copy.

Minimum equipment required is a

8080/8085/Z-80 mainframe with 48K of memory, floppy or hard disk, CRT and printer using CP/M microsoft MBasic. Suggested retail price is \$150. For more information contact Carolina Business Computers, Inc., Oakwood Center, 350 3rd. Ave. NW, Hickory, NC 28601; (704) 322-6005.

Circle No. 117

**Cosmac VIP Software**

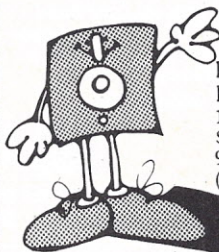
Aresco has announced two new volumes of Tom Swan's PIPS for VIPS series. The PIPS volumes are devoted to utility and game programs for the novice and intermediate Cosmac VIP owner, with instructions enabling ELF owners to convert their systems.

PIPS I contained seven programs, including an editor and a character designer which permitted "high-resolution" graphics on the VIP. PIPS II possesses all the necessary instructions for modifying the PIPS I editor for use with an ASCII keyboard. It also contains a Chip-8 Assembler and two text files on which the user can practice assembly. The 160+ page manual and cassette package, priced at \$19.95, are available from Aresco.

PIPS III has two game programs; VIP-Oker and Flip-Flop. VIP-Oker is a

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-80 Software Critique Issue No. 1

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80-US Journal, Sept/Oct '79

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CIRCLE 58



## WHAT'S COMING UP

four-handed poker game utilizing VIP graphics to display the cards. Flip-Flop is a VIP version of the well-known Othello games. The programs are documented and listed in the manual, the company said. PIPS III is available from Aresco for \$19.95.

For more information contact Aresco, P.O. Box 1142, Columbia, MD 21044; (301) 730-5186.

### 6800 12K Basic

Wintek's new 12K Basic, an interpreter for the 6800 microprocessor, supports numeric, string, and boolean data types. Additional features including floating point, scientific functions, and a random number generator aid in engineering, scientific and data processing applications. Direct memory read and write, assembly language sub-routines, flexible input/output are oriented toward process and data acquisition applications. Lexical pre-processing speeds runtime efficiency. Features include interactive syntax checking, command completion, 21 error statements.

Cassette based and floppy disk based versions closely conforming to ANSI X3.60-1978 are available for \$95. For more information contact Wintek Corporation, 1801 South Street, Lafayette, IN 47904; (317) 742-8428. Circle No. 162

### Software Speed Modification

A utility for the TRS-80 Level II tape system allows Loading, Saving and Verifying Basic or system programs faster.

The 'B-17' 1700 Baud Loader allows the user to create faster versions of their software for personal use. Ancillary features include a Video Action Indicator, which also lets you see the best tape load volume; error-trapping routines; Load and Go options that let your program start executing automatically after loading and allows the use of a name for Basic programs of up to (any) 6 characters long.

B-17 will not load if the XR2-2 cassette mod is installed in the key-board. Included with all B-17 programs shipped is a technical addendum which outlines a switch installation to overcome this barrier for the user.

Because B-17 can be easily backed up by the purchaser, the company makes no refunds. ABS is not responsible for user-inflicted damage to B-17 with spikes generated by uncorrected CTR-80 recorders and a mandatory charge of \$5 to correct this damage is required.

B-17 is priced at \$35 postpaid. For more information, contact ABS Suppliers, P.O. Box 8297, Ann Arbor, MI 48107.

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### CIRCLE 50



## COMPLEMENTS

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Lightweight (approximately one and one-half pounds), the case protects your Apple from the environment. The case is not suitable for truck or baggage shipping, but acceptable for carrying

on airplanes.

Apple Sack sells for \$85. For more information contact Tele-Terminals, Inc., 7216 Boone Avenue North, Brooklyn Park, MN 55428; (612) 535-5330; National WATS: (800) 328-3072; MN WATS: (800) 442-3006.

Circle No. 137

### Addressable Pet Printer Adapter

The ADA 1400 from Connecticut microComputer, drives a printer with an RS-232 interface from the PET IEEE-488 bus. The ADA 1400 is addressable, works with the Commodore disk and prints upper and lower case ASCII.

Included are a PET IEEE type port for daisy-chaining other devices and a cassette tape with programs for plot routines, data formatting and screen dumps.

The ADA 1400 sells for \$179 and includes a PET IEEE cable, RS-232 cable, power supply, case, instructions

and software. For further information contact Connecticut microComputer, Inc., 150 Pocono Rd.; Brookfield, CT 06804; (203) 775-9659. Circle No. 155

### Storage Systems to Protect Magnetic Media

The File One & File Two, storage systems, have been designed by The Morley Co. to protect magnetic media. The systems are portable work station units which convert from Magnetic cards to floppy disks and back again by removing or inserting compartment dividers. They provide accessibility and protection from accidental damage or particulate contamination. File One accommodates 500 mag cards or 100 floppy disks and costs \$89. File Two, priced at \$29.95, holds 200 mag cards or 40 floppy disks. For more information contact The Morley Company, 909 Islington Street, Portsmouth, N.H. 03801; (603) 436-5430. Circle No. 120

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- **Northeast:** Arlene Joseph, Benwill Publishing Corp., 2 Park Ave., New York, NY 10016; (212) 340-9780.
- **California:** Michael Reynolds, 924 Westwood Blvd., Los Angeles, CA 90024; (213) 478-3017.
- **Japan:** K. Yanagihara, International Business Corp., 10-10 Shinjuku 3-chome, Shinjuku-ku, Tokyo, 160 Japan; (03) 350-0272.



## Processor Increases Execution Speed

California Computer Systems' Model 7811B Arithmetic Processor Unit is designed for increasing the execution speed of Applesoft II programs as well as speeding up math functions available to the programmer. Increased speed allows the Apple II to produce more sophisticated high resolution graphics.

The card employs the AMD9511 APU, a hardware floating point unit powerful enough to decrease program execution time by up to one order of magnitude. This arithmetic processor provides high performance on fixed and floating point arithmetic operations and on floating point trigonometric operations, and enhances the mathematical capabilities of the Apple II.

Model 7811B plugs into an Apple II expansion slot. The CCSOft interpreter is loaded from the diskette provided with the board. The system is then

ready to execute programs written in Applesoft. The CCSOft interpreter is identical to the Applesoft interpreter, except CCSOft sends arithmetic functions to the Arithmetic Processor for fast execution in hardware, instead of executing the arithmetic in software. The CCSOft interpreter will execute most programs written in Applesoft.

The board will execute all Applesoft II arithmetic functions, plus additional functions not available in Applesoft II. The functions include ASIN(x), ACOS(x), LOG10(x), SINH(x), COSH(x), TANH(x), INVERSE(x) and PI.

The CCS 7811B maintains a precision of 6.5-plus significant digits, and offers a range of approximately  $10^{\pm 20}$ . It is available fully assembled and tested with complete documentation included and has a one-year warranty. Price for this unit is \$299.96. For more information contact California Computer Systems, 250 Caribbean Dr., Sunnyvale, CA 94086; (408) 734-5811. *Circle No. 152*

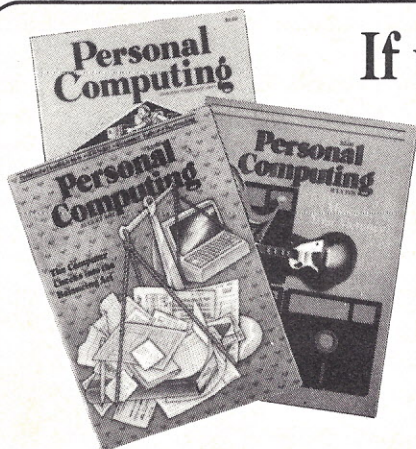
## Head Cleaning Diskettes

Since floppy disk systems operate in "dirty" environments where dust, lint, smoke and cigarette ash can contaminate the read/write head and cause data transfer problems, Lifeboat Associates has announced Head Cleaning Diskettes.

The cleaning diskettes are manufactured by attaching a lint-free nylon mat to a mylar substrate. The design avoids damaging abrasion, keeping head wear to within industry standards for normal magnetic media (less than 92 micro-inches after 92 hours continuous head load.)

The diskette is inserted into the drive the same way as a floppy disk, and the head is loaded for 30 seconds. Lifeboat recommends that this procedure be used once per day as prevention against oxide build-up.

Head cleaning diskettes are available for standard eight-inch and minidiskettes for \$20 each, \$45 for three. Each



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Details on the \$119 stand are available in a 48-page catalog of data supplies and accessories from Devoke Data Products, 3780 Fabian Way, Palo Alto, CA 94303; (415) 494-8844. *Circle No. 105*

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## **LITERATURE**

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### **Guide to Accessories and Supplies**

A 100-page "Guide To Information Processing Accessories And Supplies," the 1980 edition, is now available from American Word Processing Company.

Additions include filing and retrieval systems for microforms and disk paks, a media safe, additional lines of systems furniture, ribbons for minicomputers and WP equipment, the "Clean-

Air Machine" — a device which rids the air of smoke and pollutants — and printwheels and thimbles.

For a free copy contact American Word Processing Co., 18730 Oxnard St., Tarzana, CA 91356; (213) 705-2245. *Circle No. 128*

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### **Data Accessories and Supplies Catalog**

A free 48-page illustrated catalog features supplies and accessories for users of data processing and microfilm. Included are magnetic media; media storage, filing and retrieval systems; and printout storage and handling systems. Also featured are printwheels, printer ribbons, fanfold computer paper and interconnect cables.

Most orders are shipped within 24 hours and complete satisfaction is guaranteed, the company said.

Prices for all products are shown in the order-direct catalog. Contact Devoke Data Products, P.O. Box 51230, Palo Alto, CA 94303; (415) 494-8844. *Circle No. 131*

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### **TRS-80 Software Directory**

CompterMat has published the 80 Software Directory for the Radio Shack TRS-80 microcomputer. The latest edition has over 5000 TRS-80 software listings available from over 450 vendors.

The directory, distributed in the U.S., Europe, Japan, Africa, Australia, South America and Canada, is published 3 times a year; winter, spring and summer. It is now in its second year of publication, and has tripled in size since it first began, said ComputerMat.

Each listing includes the title of the program, a short description, Basic needed, memory required, class, cost and the media it is available on. Each listing also includes the name of the vendor that supplies the program, and the rear of the directory has complete names and addresses of over 450 suppliers of TRS-80 Software. The directory is divided into the areas of business, education, games, home, math and utility.

Dealer discounts are available from ComputerMat. The price of \$6 per issue includes postage mailed in the

U.S. Canada and foreign orders add \$2 for air mail. For more information contact ComputerMat, Box 1664, Dept. J, Lake Havasu, AZ 86403; (603) 855-3357. *Circle No. 125*

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### **Equipment and Supplies Catalog**

V.R. Data's new 8th anniversary catalog features such new products as "The Source" and the complete Centronics and Apple line of equipment and supplies by MPI, Pertec, Nashua, NEC, Memorex, Maxell and Dysan.

For a copy contact V.R. Data Corporation, 777 Henderson Blvd., Folcroft Industrial Park, Folcroft, PA 19032; (800) 345-8102. *Circle No. 122*

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### **Guide to Learning Programming**

A hands-on guide to learning programming in Basic, "Training Your Computer," is available in TRS-80, Apple and Pet editions.

The booklet leads beginners through standard programming techniques in short programs typed into the computer. Explanations, variations and suggested activities accompany each lesson.

List price is \$3.75. For more information contact Metra Instruments, Inc., Pickering Division, 2056 Bering Drive, San Jose, CA 95131; (408) 297-8530. *Circle No. 119*

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### **TRS-80 Microcomputer Sourcebook**

TRS-80 Microcomputer Sourcebook for Educators is a comprehensive guide to the use of microcomputers as both a medium and object of instruction in the classroom, and as a tool for the school administrator.

The 27-page booklet describes use of the microcomputer in the classroom and provides guidelines for selecting a system based on potential applications, costs, service, reliability and courseware.

The Sourcebook is available free on request from Radio Shack, Department NR-17, 1300 One Tandy Center, Fort Worth, Texas 76102; (817) 390-3272. *Circle No. 116*



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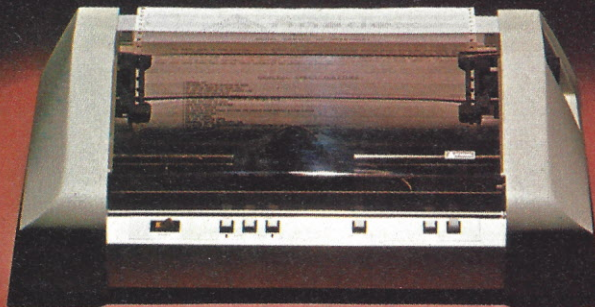
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